The Journal of Obstetrics and Gynæcology of the British Empire

VOL. XVI. OCTOBER, 1909. No. 4.

A Critical Inquiry into the Causes of the Internal Rotation of the Fœtal Head.

By R. H. PARAMORE, M.D. (Lond.), F.R.C.S. (Eng.),

Hunterian Professor of the Royal College of Surgeons of England.

Internal Rotation discovered: Early Views of its Causation: the Supposed Influence of the Ischial Spines.

Up to the middle of the eighteenth century, it was thought that the fœtal head entered the pelvis with its long (*i.e.*, antero-posterior) diameter in the conjugate and its face towards the sacrum, and that it crept into the world on its hands and feet. Sir Fielding Ould, of Dublin,[1] was the first to reject this conception, and in 1742 he stated that in natural presentations, whilst the chest of the child lies on the maternal sacrum, the face is always turned to one or other side with the chin directly on one or other of its shoulders.

Smellie[2] accepted this view of Ould's that the fœtal head entered the pelvis in the transverse diameter, and pointed out that the head changed its position at the outlet so as to be born with its long axis in the conjugate; a change which he considered due to the action of the bony pelvis, and which was only brought about when the head had reached the pelvic floor and had begun to experience the resistance offered by the ischial spines.

It was left for Saxtorph[3] and Solayres[4] to show that these views were erroneous, and that the head entered the pelvic brim with its long axis in one or other of the oblique diameters; an opinion that was held by Berger, the teacher of Saxtorph, and which he gave in his lectures probably prior to 1759 (Leishman). Saxtorph, who, however, worked out the mechanism of parturition for himself, agreed with Smellie that internal rotation of the head occurred at the outlet of the pelvis and was due to the pressure of the ischial spines. Solayres, the teacher of Baudelocque, who directed attention to the work of his master, discovered from his own observations that the head in normal cases lies obliquely at the brim.

Schmitt[5] (1804) accepted these views, but thought internal rota-

tion of the fœtal head was solely due to uterine activity; a view which, strange as it appears, has within recent years again been brought forward. He says: "Writers have erred in ascribing the cause to the resistance which the head meets with in the side parts of the pelvis and to the convenient space afforded by the hollow of the sacrum, for the real cause is grounded more deeply in the directing power which, in conformity with mechanical laws, is afforded by the uterus." (Quoted by Leishman.*) In support of which he advances that rotation occurs even in footling cases.

Naegele [6] (1819) pointed out that the head reached the pelvic floor still obliquely placed, and engaged the opening therein in such a fashion that the caput succedaneum was formed in left occipito-anterior positions, not medianly, but laterally over the upper and posterior angle of the right parietal bone; and, further, that it was actually born, not with its long axis (sagittal suture) coinciding with the conjugate, but also somewhat obliquely.

He stated the occurrence of occipito-posterior presentations is much more frequent than was at that time supposed: a fact which he considered was due to insufficient or to too late examination of the cases, since most of them during the process of birth undergo a rotation so that the third vertex becomes converted into the second with a natural birth. This rotation, Naegele considered, was due to the resistance offered by the "floor of the pelvic cavity or the steep surface, which is formed by the lower part of the sacrum, the coccyx, and the sacro-coccygeal ligaments." These force the occiput to turn from behind forwards so that the long diameter slowly rotates into the left oblique diameter. He therefore practically accepted, as regards this point, the views which had been expressed before him.

Leishman [7] (1864) confirmed the statement made by Naegele that the head is born obliquely in the following way:—Whilst an assistant held one end of a cord against the tip of the coccyx of a woman in labour, the other end was carried forward along the middle line of the vulva to the centre of the symphysis pubis. As the advancing pole of the head first appeared at the vulva and came to press on the cord steadily held in this way, Leishman drew a line by means of a camel's hair pencil moistened with ink along the cord upon the head. It was found at the final exit that the centre of the posterior margin of the vulva was not in relation with the sagittal suture and central line of the face, but in continuation of a line which passed over the left malar bone.

Leishman believed that the most important factors concerned in rotation are the ischial planes and spines, because they form fixed points of resistance which determine the direction of motion. He argued: Since these bones gradually converge as they descend and encroach greatly upon the transverse diameters of the floor of the

* I have been unable to obtain a copy of Schmitt's book.

cavity, they of necessity cause the head to assume a different position with reference to the bony canal. He discussed the action of the so-called ischial planes, and said it was assumed, that whilst the anterior directs the occiput forward, the posterior plane of the opposite side directs the forehead backward towards the sacrum. Whilst he believed that the part played by the posterior ischial plane had been exaggerated, he was of opinion that the anterior ischial plane with the ischio-pubic ramus and the soft parts which cover the obturator foramen "form a large surface, which is bevelled off in front and is in every respect admirably adapted to the end in view."

Apparently many writers on obstetrics have thought that the projection inwards of the ischial spines is a dispensation of Nature, specially evolved for the mechanism of internal rotation: as though this movement, indeed, were a *sine quâ non* of childbirth. But internal rotation of the fœtal head as a mechanism occurring during this act is not an essential condition, for if the pelvis is big enough and the fœtal head small enough the head can be born without internal rotation. This movement is only an accident; it only results because the fit between the head and the pelvis is a close one, and because the musculature of the pelvic floor resists delivery and thereby makes the fit a closer one than it otherwise would be. The inward projection of the ischial spines, from which the posterior parts of the levator ani muscles and the ischio-coccygei (coccygei) arise, is also an accident: an evolutionary incident merely. It has been brought about by the change in the direction of the pull of the musculature of the pelvic floor, which the assumption of the erect posture determined: just as the position and shape of the lesser trochanter of the femur has been caused by the traction of the psoas muscle. That this is so is shown by the examination of the pelves of the lower animals, in which no such inflection of the ischial spines is found. With these and other evolutionary changes birth continued to take place, and could only do so by an adaptation of the fœtal head, enlarged by the growth of the brain, to the structure of the pelvis—an adaptation which consists of various rotatory movements of which one is the subject of this inquiry. The pelvis itself, however, in the female has undergone modifications in adaptation to the increased size of the fœtal head, in that it has become wider and shallower. But the projection inwards of the ischial spines occurs in both sexes; if it be more marked in the female than in the male it is only because the female pelvis is wider, the pelvic floor musculature for this reason stronger, and the pull on the spines therefore greater.

The conception of the part played by the ischial spines continued to hold sway for many years, indeed until Veit [8] (1887) and Varnier [9] (1888) showed that the bony pelvis of itself was insufficient to cause

internal rotation. It is clear, if the old view had been correct, that, when the head enters the pelvis in the oblique diameter with the forehead anterior, the forehead ought to be directed towards the pubic arch and the head to be born with the occiput behind with the same frequency with which in first vertex cases the occiput is directed forward. But this does not happen. In the great majority of primary occipito-posterior cases a rotation of the head occurs during its passage through the pelvis, so that the forehead looks posteriorly when born.

The View that Internal Rotation is caused by the Pelvic Floor.

Since it was shown that the bony pelvis was not responsible by itself for internal rotation, obstetricians began again to ask themselves what factor determined it. Some believe that it is the pelvic floor itself which causes it, and this seems to be the prevailing opinion. Veit, from his study of the subject, came to this conclusion. Whitridge Williams [10] accepts this view, and argues that since the opening in the pelvic floor is oval in shape and retains this outline (so he says), even when markedly distended, "the head must adapt itself to this in order to be born." Against this, however, it may be said that in ordinary vertex presentations the part which bulges through the opening, before extension is continued by the intact perineal body, is almost circular in circumference, the difference between the bi-parietal and sub-occipito-bregmatic diameters amounting only to 0·5 cm. Moreover, when the pubic arch is sufficiently wide and the distance between the ischial tuberosities normal (11 cm.), it is difficult to accept the statement that the transverse diameter of the opening always remains considerably less than the antero-posterior diameter, because, if the opening is to retain its shape, the posterior boundary will have to recede twice as far as each lateral boundary is pressed aside, for the anterior boundary, the pubic arch, is fixed (immobile); and surely as much, or even a greater, resistance will be experienced by the fœtal head in determining a recession of the posterior boundary of the pelvic floor aperture as in the separation of its lateral margins. The difficulty of delivery in persistent occipito-posterior cases, which is caused by the necessity for a greater recession of the posterior part of the pelvic floor, seems to confirm this. Further, it can scarcely be maintained that the character of the opening is sufficient to cause such a rotation as occurs in the majority of occipito-posterior presentations; for were this factor the determinant, it ought to prevent the occiput, primarily posterior, from rotating to the front.

In support of this view the following arguments have been advanced:—

(1) That Dubois [11] showed that internal rotation could take place in the dead. In a woman who died shortly after her confinement, he

opened the uterus and placed the recently delivered fœtus in the right occipito-posterior position and thrust it downwards through the maternal soft parts. He found on the first three trials that the occiput in each case rotated to the front, but subsequently, when the elasticity of the soft parts had been lost, this rotation forwards did not occur.

(2) That Edgar [12] screwed a swivel into the head of a fœtal cadaver half an inch behind the small fontanelle, attaching a yard of cord to the ring of the swivel, and repeatedly dragged the head through the pelvis of a woman who died shortly after her confinement, and found that the occiput invariably rotated to the front, even when the head entered the pelvis in the posterior positions, as long as the pelvic floor "retained its integrity." When the elasticity of the floor became impaired by overstretching, the head traversed the pelvis in very nearly the same position as it had entered.

(3) That in a case of childbirth occurring in a paraplegic, rotation of the occiput forward occurred (Amand Routh [13]).

These experiments and observations show conclusively that if internal rotation is dependent upon the pelvic floor musculature that it occurs as well when the musculature is dead as when living, as well when paralysed as when in the full vigour of its functional activity. It is, therefore, obvious that the musculature merely plays a part in causing internal rotation of the head by obstructing delivery. This was clearly shown by the continued repetition of Dubois' and Edgar's experiments, for when the soft parts had become impaired by repeated stretching, rotation failed to occur. That this obstruction, caused by the resistance of the pelvic floor to its displacement downwards by the fœtal head, is unable by itself to determine internal rotation is demonstrated by the following facts:

(1) That rotation is rarely complete (Naegele, Leishman).

(2) That it does not usually occur when the fœtal head is small and the maternal pelvis large (Herman [22]).

(3) That in bregmato-cotyloid presentations occurring in women in whom the pelvis is small and round (small round pelvis) the posterior position of the occiput persists (see Edgar*). In these cases, in spite of the fact that, because the flexion is good, the occiput, although posterior, of necessity meets the pelvic floor first, rotation does not usually occur. Here there is no question of the forehead being at a lower level and meeting the pelvic floor first. All the pelvic floor can do, when it is being depressed by the fœtal head, is to cause a projection forwards of the advancing fœtal pole in the sagittal plane towards the pubic arch; that is, in ordinary vertex cases, it causes extension, but this movement is not rotation.

* Etiology of persistent occipito-posterior position. (*Obstetrics.*)

The View that Internal Rotation (of the Fœtal Head) is caused by a Primary Rotation of the Fœtal Trunk.

If neither the bony walls of the pelvis nor the resistance of its muscular floor can alone cause this rotation, what does determine it?

Whether Schmitt[5] (1704) foresaw this difficulty or not, I do not know; at any rate he put forward the idea that the expelling force is the sole determining factor in causing internal rotation (Leishman).

A similar view was brought forward by Olshausen[14] in the editions of Schroeder's Lehrbuch, which he and Veit edited, and was elaborated in a special contribution[15] which he subsequently published (1901). In the 11th edition of Schroeder's Text-book (1891), Olshausen says (p. 194) there are two factors concerned in causing internal rotation: (1) the influence of the fœtal trunk on the fœtal head; and (2) the form and elasticity of the muscular pelvic floor. Thus:—

"The primary factor is the rotation of the fœtal trunk, the back turning from the side to the front during the expulsion period. It is not difficult to convince oneself of the regular occurrence of this rotation, which is shown by palpation and auscultation. The fœtal heart sounds during this stage of birth are always best heard towards the middle line. The rotation of the trunk is the consequence of the increasing tendency of the uterus to become flattened (antero-posteriorly) as the liquor amnii escapes. As this diminishes the uterus tends to assume its original flattened form, for it is only subsequent to the growth of the ovum that the transverse and antero-posterior diameters have become almost equal.

"The back, however, seldom completely rotates to the front. Generally, when the sagittal suture has reached the antero-posterior diameter, the back remains about 30° (Schatz) behind the rotation of the vertex.

"The rotation of the trunk has only initiated that of the vertex, which is continued and completed by the other factor, the activity of the pelvic floor. This is a gutter-like structure, formed of soft parts, which passes from behind forwards and ends anteriorly at the vulva. The already obliquely placed vertex enters with its long axis (fronto-occipital) obliquely to the longitudinal diameter of this gutter, the two lateral muscular walls of which, in virtue of their elastic resistance against the ellipsoidical head cause the sagittal suture to assume, at least approximately, the antero-posterior position."

This view of the part played by the pelvic floor is in close agreement with that of Whitridge Williams (*v. ante*).

Bumm,[16] who accepts Olshausen's explanation, justly argues: If the pelvic floor musculature is the answerable factor and causes the occiput, lying anteriorly in the oblique diameter, to rotate for-

Fig. 1. From Sellheim's article (p. 14) : showing method of investigating flexibility of fœtal spine in various directions in the living child. The body is placed on a pillow and kept fixed by means of a blanket held in position by the hands of an assistant. *a* is a screw ring, mounted on wood ; this is placed on summit of head and maintained in position by an elastic cap, through an aperture in which the ring protrudes. The hook of a dynamometer is passed through the ring, and the necessary force required to flex the head in various directions is determined.

wards under the pubic arch, the same factor, when the forehead occupies this position, should cause a similar rotation of the forehead under the pubic arch, and this should occur as frequently in the one case as in the other. Since this is not so, some other factor must be looked for. This he finds in the activity of the uterus. In support of this contention he says that during pregnancy the position of the fœtal head is influenced by the position of the fœtal trunk; that during labour the flattening of the uterus causes the fœtal back to become anterior; that this movement is communicated to the fœtal head; that, therefore, the fœtal head possesses the tendency to rotate forwards from the outset of labour. He believes this influence of the fœtal trunk over the position assumed by the fœtal head is sufficient to determine the anterior rotation of the occiput even when this enters the pelvis posteriorly in the oblique diameter, in spite of the counteracting influence which the pelvic floor presumably exerts. The tendency of the occiput to rotate into the hollow of the sacrum is prevented by the resistance of torsion it encounters by the anterior rotation of the trunk. "It is the trunk which institutes the anterior rotation and imparts to the occiput the impulses which cause it to rotate in the same direction." The rotation of the fœtal trunk is determined by the projection forwards of the maternal lumbar vertebral column; this prevents the fœtal back from turning completely behind, and, combined with the effect of the uterine contractions, causes it first to become lateral, and finally anterior. In this rotation the fœtal trunk carries the occiput with it.

The View that Internal Rotation is caused by the Adjustment of the Fœtus (as a whole) to the Parturient Canal.

Sellheim [17] believes the essential cause of the internal rotation of the fœtal head lies, at least in part, within the fœtus itself; and that the movement is determined by the unequal flexibility of the fœtal axis in various directions. Since the lower part of the parturient canal is curved, the cylindrically-formed fœtal body, in response to physical laws, bends itself in the way corresponding to the curvature of the birth canal. Although this rotation depends upon the existence of a force from above, it is independent of the particular kind of force (general rise of intra-uterine pressure; pressure along fœtal axis; action of gravity). He therefore does not accept Olshausen's hypothesis concerning the direct effect of uterine activity (*i.e.*, flattening) upon rotation.

Sellheim's View Criticized.

That the flexibility of the fœtal axis is not the same in all directions Sellheim shows experimentally (see Fig 1); in the region of the neck, for instance, the fœtal head can be bent backwards more easily than in any other direction. This, however, only obtains in living children, for "in dead children after the rigor mortis had

disappeared, the difference in the flexibility in different directions was considerably less than was found during life." This difference, Sellheim believes, is due to the muscle tonus of the large group of extensor muscles of the back and head (erector spinæ et capitis). The next point that he makes is that the attitude of the fœtus within the uterus, as regards the relative position of the head to the trunk, is not one of extreme flexion, which is only assumed at the onset of labour by the head being pressed downwards into the conical lower uterine segment; but the resting position is one in which the fœtal head is neither flexed nor extended. With this most will agree. It is obvious that the extensor muscles of the back, with the other body muscles, will occasionally actively contract, just as the limb muscles do (fœtal movements); for it is upon such activity that the muscular physique of the fœtus, even whilst still intra-uterine, depends.

From the opinion that the position of the fœtal head in the attitude of rest is one between flexion and extension, Sellheim argues that when the head is coerced to assume an increased flexion by entering the pelvis, the tension of the extensor muscles is increased. At the same time, in order to diminish the frictional resistance between its surface and that of the parturient canal to the lowest point, the fœtus assumes in all its parts a form approaching a cylinder as much as possible.

Thus this author supposes, that as the fœtal cylinder is thrust downwards into the pelvis the occiput rotates forwards under the pubic arch because the birth canal bends forwards in this direction and because the muscles of the fœtal back are continually exerting a traction upon the head, trying to bring it from its forced position of extreme flexion into the resting position midway between flexion and extension. That such a mechanism is possible with models Sellheim shows experimentally (see Fig. 2). But the conditions of his experiments are not analogous to those existing within the living fœtus as it is being extruded through the pelvis of the living woman. The part representing the head in the model of the birth-object is fixed to that representing the trunk by two spiral springs, and is maintained extended, although it is capable of being moved in all directions. The representation of the birth canal is a curved elastic cyclinder, the sides of which readily bulge as the head of the phantom is passed through it. This is effected by an increase of pressure (air pump) from above, comparable to a general rise of intra-uterine pressure.

It is plain that if the fit is tight and the resistance to the passage of the fœtal model so great that considerable difficulty is experienced in passing it through such a passage, that a rotation of the birth-object (about its long axis) within the birth canal at the 'knee,' provided the head is capable of moving upon the trunk in all

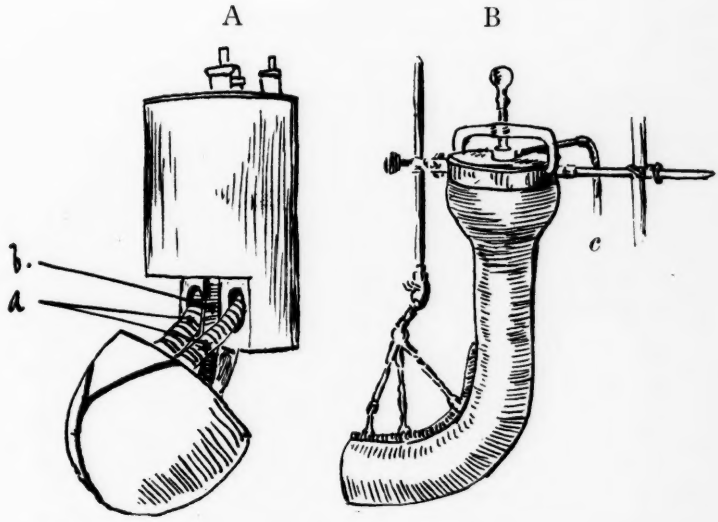

Fig. 2. From Sellheim's article (fig. 36). A represents model of the 'birth object.' *a* spiral springs, which place the maximal flexibility (Biegungs facillimum) neckwards, and evoke the tendency to extend when flexion occurs. Note that the essential difference between the phantom and the living child is that the stretched spiral springs of the one cannot tire and relax, whereas the extensor muscles of the neck of the other not only can, but probably invariably do so. *b* is a vertical spiral spring.

B represents a model of the birth canal (drawn to a much smaller scale than A). It is formed of elastic tissues and offers little resistance to the passage of the birth object A, which is effected by means of compressed air passed in by the tube *c*.

directions,* although with different facilites, will be correspondingly difficult. It can, indeed, only occur if the fœtal force, which is tending to extend the head by exerting a pressure upon the wall of the birth canal in the region of the occiput, is considerably greater than the summation of the pressure forces existing between the other points of contact around the circumference of the head and the wall of the passage embracing it. The greater the obstruction, the greater must the driving force be; the greater the driving force, the greater are the circumferential pressure forces; the greater these become, the less significant the fœtal extending force. Thus in the presence of marked obstruction—and the obstruction to the head in normal parturition is marked—internal rotation will not occur as a result of any tendency on the part of the fœtal head to extend, unless this be very great indeed. In such a case the head will merely deviate in the direction in which the cylinder containing it deviates, *e.g.*, in positions in which the fœtal head is transverse, the side of the face of the model will approach its shoulder. If, on the other hand, the resistance offered by the phantom birth canal is so slight that its sides easily bulge to allow the birth object to pass, as obtains in the experiment in question, this fœtal force can come into play and rotation around the fœtal long axis will occur.

In the living woman, however, the parturient canal, as an actual curved cylindrical passage, does not exist before labour. It only becomes distended and assumes its curved course when the pressure with which the fœtal head displaces the pelvic floor causes it to occupy a position in which the resistance it offers, from being axial, becomes partially circumferential, *i.e.*, laterally and posteriorly. During the earlier part of the second stage of labour the pelvic floor opposes the advancing pole of the head; its resistance is axial. But as the head engages the aperture, the pelvic floor is gradually displaced laterally and posteriorly, whilst the advancing pole of the head, pari passu with this descent, is directed forwards. It is during this displacement, *i.e.*, this descent, that internal rotation occurs. If it can be supposed that the activity of the extensor muscles of the fœtal back are capable of exerting a force greater than that exerted by the maternal pelvic floor in resisting displacement and distension, then the Sellheim hypothesis must be accepted and the fœtus be considered as playing a part in the mechanism of internal rotation. But it can scarcely be believed that this is so. The hypothesis is disproved by the fact that in cases in which it is certain the bony pelvis exerts no influence upon the position assumed by the fœtal head, in which, *e.g.*, the fœtal head is unusually small, or the maternal pelvis unusually large, this rotation of the occiput forwards does not necessarily, or indeed as a rule, occur: and these are just the cases in which, were Sellheim correct,

* If this does not obtain, the passage will be obstructed and the birth-object will jam within the birth canal.

we should suppose it ought to occur; for the circumferential pressure forces between the displaced pelvic floor and the fœtal head are presumably less when the fœtal head is small than when it is large, and the fœtal extending force therefore becomes more significant. On the other hand, when, in full-sized fœtuses, this supposed activity of the muscles of the back is put out of court, *e.g.*, by fœtal death, rotation of the occiput still occurs, as Dubois' experiment demonstrates.*

In the living fœtus, moreover, if increased flexion of the head is accompanied by increased tension of the extensor muscles of the head, it is scarcely credible that this increased tension can be maintained for long: for in primiparæ, at any rate, even before the membranes rupture, the head is found to assume this attitude of increased flexion; and whilst it is passing through the cervix uteri such pressure is brought to bear upon it for so long a time that these fœtal muscles will most certainly yield and relax and adapt themselves to this position of the head. Thus their tonus being reduced by continued traction, these muscles cannot exert any tendency to cause extension.

Olshausen,[18] criticizing Sellheim's view, affirms that careful examination will show that the fœtal trunk rotates anteriorly in many cases before the head, and may even do so to a greater extent than the head. If rotation of the head is brought about alone according to Sellheim's hypothesis, how, he asks, is rotation of the trunk explained? It is impossible, he says, for anyone to suppose that the trunk, already closely invested by the soft parts, is caused to rotate by the head. If it does not do so, it must rotate independently, and then this will influence the rotation of the head, favour the same, perhaps from the first institute it. If the trunk does not begin the rotation, the head in consequence does not rotate. If one observes the position of the trunk when the head is deeply placed transversely in the pelvis (vertex or face positions), one can easily confirm, in favourable conditions of the abdominal and uterine walls, the transverse position of the trunk. This is clearly recognized by palpation and the marked prominence of the anterior shoulder. In face and brow presentations, it is most evident that the defective rotation (*e.g.*, in chin posterior positions) of the fœtal trunk is the cause of the defective rotation of the head, as by exact external examination one can almost always, or very frequently, demonstrate.†

* This statement, of course, does not apply to macerated fœtuses.

† In face presentations, the convexity formed by the chest and abdomen, the result of fœtal extension, takes the place of the convexity of the fœtal back in vertex cases; and, according to Olshausen, is caused to rotate to the front in the same way as he supposes the convexity of the back in vertex cases is forced to do—the concavity formed by the occiput and back in face cases, adjusting itself to the projection forwards of the maternal lumbar spine.

Olshausen's View Criticized.

In support of the statement that primary rotation of the fœtal trunk is caused by the flattening of the uterus, which, he says, regularly occurs with the escape of a large quantity of the liquor amnii (p. 34), Olshausen [15] argues that just as at the beginning of pregnancy the enlargement of the uterus, for the most part, occurs in the antero-posterior diameter ('im Dickendurchmesser'), without which it could not lodge an ovum even of small volume; so a diminution first results in the same diameter, by which the uterus, not merely enlarged by growth, but also stretched mechanically by its contents, tends, with the partial evacuation of its contents, again to assume the antero-posteriorly flattened form. He states that Fehling (p. 35) has drawn attention to this, and that the same author has referred especially to Barbour's horizontal sections which show a progressive shortening of the sagittal diameter from the first to the third stage of labour.

Olshausen states that the degree of flattening of the uterus may be very considerable (p. 36). In support of this he brings forward as evidence the frozen sections published by Zweifel and Barbour, in the latter of which, whilst the transverse diameter of the body of the uterus was 215 mm., the antero-posterior ('gerade') was only 112 mm. He does this without qualification, although when writing of the position of the uterine axis in the living and in the dead (pp. 6 and 7), he prefaces his remarks (p. 4) by saying one cannot accept all that is seen in these frozen sections as correct, and as representing the conditions existing during life; for gross changes occur, in consequence of the weight of the organs, after the existing muscle tonus has ceased. In the same place (p. 6) he adds that the frozen sections there referred to* were fixed, as most of the descriptions expressly state, in the dorsal decubitus. In this position it is clear a flattening of the uterus is most likely to occur; indeed, it would be remarkable if it did not do so.

But Barbour [19] had his specimen frozen in the erect position. He was unable to obtain the whole cadaver; the pelvis and lower portion of the abdomen up to half an inch above the umbilicus anteriorly, and to the third lumbar vertebra posteriorly being removed. The section referred to by Olshausen is figured in Plate IV.[20] It has passed through the fourth lumbar vertebra and the representation is life-size. The uterus is markedly flattened from before backwards, the posterior wall being bulged forwards medianly by the vertebral column, so that the uterine cavity is reniform on transverse section. The figure, measured by a tape, gives $8\frac{3}{4}$ inches for the transverse diameter (outside measurement), and $5\frac{1}{4}$ inches for the antero-posterior. It is difficult to account for this extreme flattening in the absence of the conditions obtaining

* *i.e.*, those dealing with the uterine axis.

during the freezing. It may have been produced by direct pressure against the side wall of the vessel in which the freezing took place. At any rate, the section cannot be taken as showing what occurs during uterine activity, for we cannot suppose the maternal lumbar column can bulge the posterior uterine wall inwards when the uterus contracts. Clinically, we know, that on contraction the uterus tends to become more cylindrical or pyriform, the abdominal swelling becoming actually more prominent in spite of the simultaneous contraction of the abdominal wall musculature. Under these conditions it is difficult to understand how any flattening of the uterus can occur, or how the presence of the natural lordosis of the maternal lumbar vertebral column can influence the position of the fœtal trunk during uterine activity. And if the possibility of a torsion of the fœtal trunk by a primary rotation of the fœtal head be denied for the reason, which Olshausen offers, that the fœtal trunk is already closely invested by the soft parts, how is it possible for the uterus itself to cause the fœtal trunk to rotate in the presence of such a close investure? Even if the frictional resistance to rotation between the fœtal trunk and the uterus is greater than the frictional resistance between the unyielding walls and muscular floor of the pelvis and the fœtal head, as it may be when all the liquor amnii has escaped and the fœtal trunk is tightly grasped by the vigorously contracting uterus, still this is not the normal condition; and it is not impossible that the uterus itself, even when its musculature is contracted about the contained fœtal trunk, may be capable of being rotated to some extent, whilst the fœtal head within the pelvis, provided it be of average size, can only rotate by its continued descent so great is the resistance to its movement.

But even supposing, for the sake of argument, that this factor causes rotation of the fœtal trunk and that this determines the fœtal head to undergo "internal rotation," since this factor, if it occur, comes into play early in the second stage of labour, the rotation of the fœtal trunk ought also to occur early, and this in turn should determine an early rotation of the fœtal head. Further, this rotation should become progressively more difficult as labour proceeds and the head becomes jammed deeper and deeper down in the pelvis. Yet clinically we know that rotation only occurs late, as the position of the caput succedaneum to one or other side of the sagittal suture plainly shows. Indeed, rotation is rarely complete (Naegele, Leishman, Williams); but such as does occur is produced only when the head is thrust right down upon, and is closely embraced by, the contracting pelvic floor musculature.

Finally, that uterine activity can influence the position of the fœtal head during parturition and cause its rotation is immediately met with the objection that the limit of lateral movement of the head upon the trunk (or of the trunk upon the head) is considerable,

amounting to 90° without injury, and at first sight it appears impossible to accept the notion that torsion of the trunk could influence or cause a rotation of the head.

It is universally admitted that the head enters the pelvis with its long diameter in one or other of the oblique diameters of the brim according to the relative sizes of the head and the musculo-osseous entrance to the pelvis (*n.b.*, position of psoas muscles); and it seems only reasonable to suppose that as the head sinks downwards within the pelvic cavity that the shoulders of the fœtus, coming into relation with the brim, will similarly adjust themselves in accordance with the least resistance that their entrance admits, and that this is the real cause of the rotation of the fœtal trunk. This may occur apart from a similar rotation of the head, and if the shoulders come into relation with the brim before internal rotation of the head takes place, then the shoulders themselves may rotate before the similar movement of the head, a condition which Olshausen states frequently occurs.

If, however, it is difficult to believe that the position of the fœtal body can cause the occiput to rotate forwards under the pubic arch, even when the head enters the pelvis with the occiput placed anteriorly in the oblique diameter, much more difficult is it to accept this as the responsible factor for that greater rotation which usually occurs when the occiput is placed primarily behind. Sometimes, however, the mechanism which causes this rotation fails, and the posterior position of the occiput persists. As far as I have been able to discover, Sellheim gives no explanation of, or indeed reference to, this persistence. Olshausen, however, referring to occipito-posterior cases, says that whilst it is sufficiently known that usually a rotation of the occiput to the front sooner or later occurs, the cause of this is scarcely to be interpreted by the usual explanation (*i.e.*, influence of pelvic floor). But if, as often happens, the forehead originally occupies a lower position than the occiput, perhaps kept back at the pelvic inlet, then one must suppose, in accordance with the customary explanation, that the forehead, as the deepest lying part, is forced by the inclined plane ('durch die Gleitbahnen') to turn to the front. This, he says, only occurs exceptionally, because the fœtal back itself almost always turns to the front and forces the occiput likewise to rotate in this direction (p. 38).

West's View.

West, of Lincolnshire, [21] (1856) wrote clearly upon this question. Not only does he differentiate between the two varieties of occipito-posterior cases, but he states they are essentially different presentations. "That bregmato-cotyloid are in truth vertex presentations, but fronto-cotyloid are not." It is therefore not surprising to find the mechanism in each is distinct. He says it is a mistake to suppose

because the occiput is behind that it is wrongly placed; when flexion is good the vertex is then lowest in the axis of the brim, and consequently nearest and most ready for the outlet. It is not because the forehead is originally placed more *forward* that it finally passes under the pubic arch, but because that end of the head, being in the axis of the uterine efforts, first reaches the inclined plane of the coccyx and the floor of the pelvis, and thus slides forwards to the outlet.

Flexion of the Fœtal Head an important Factor, but not for the reason alleged.

There is no doubt that the rotation of the occiput forwards in occipito-posterior cases depends for one of its factors on the marked flexion of the head, as West pointed out; but the question is: How is the mechanism caused? West believed it resulted from the advancing pole of the head meeting the "inclined plane of the coccyx and floor of the pelvis"; and that in persistent occipito-posterior cases, owing to insufficient flexion, the anterior part of the head (forehead) comes into relation with the pelvic floor first, and is thus ushered forwards towards the pubic arch.

I do not know of any proof that may have been advanced to show that the forehead in fronto-cotyloid presentations is, as a matter of fact, on a lower level than the occiput and that it meets the pelvic floor first; but it seems to have been assumed that it is so. This assumption, which was necessary for the explanation of the persistence of the posterior position of the occiput, may rightly be objected to, for these cases are bregma presentations and not brow presentations; the condition is not one in which extension has occurred, but instead of flexion being good, flexion is not so good. The occiput and sinciput are approximately on the same level, and meet the pelvic floor simultaneously, *i.e.*, they are in a plane at right angles to the axis of the pelvic inlet along which the expelling force acts. There is certainly not the disproportion in levels between the position of the forehead and that of the occiput as exists in bregmato-cotyloid presentations; although, from the anterior situation of the pelvic floor aperture, the oblique position of the vagina and, therefore, of the examining fingers, the forehead may be felt more readily, because more anterior, than the occiput, and may, therefore, appear to be lower in the pelvis than it in reality is. From the fact that the pelvic floor of itself is unable to effect such a rotation as occurs in the majority of occipito-posterior or even of occipito-anterior, cases, in which, owing to good flexion, the occiput undoubtedly forms the advancing pole of the fœtal head, reasons for which we have already advanced, we must, of necessity, conclude that when rotation fails, it does not do so because the pelvic floor directs the forehead from an oblique position towards the pubic

arch, but that the mechanism which is usually effective in causing this internal rotation has failed, an important factor concerned in this failure being insufficient flexion of the fœtal head.

The Author's View.

The mechanism of descent, with which internal rotation is associated, takes place in the following way:

In cases in which flexion is good the point of impact of the advancing pole of the fœtal head (vertex) occurs at the extremity of a line drawn at right angles from the centre of the plane of the brim and reaches the pelvic floor in the region of the coccyx. At the end of pregnancy the muscular fibres arising from the ischial spines and inserted into this bone and the ano-coccygeal raphe, like the whole pelvic floor musculature, are remarkably well-developed; they are, indeed, hypertrophied. Palpation reveals them as forming veritable fleshy bellies, strangely tender when vigorously pressed against, hardening on coughing and evincing complete proof of their contractile nature. It is against this part of the pelvic floor that the vertex of the well-flexed head, be the forehead posterior or anterior, first impinges, and which first resists the head's further advance. In consequence of the continued downward fœtal thrust, the result of the uterine contractions and pains, descent of the pelvic floor, beginning at this region of primary impaction, occurs; for the pelvic floor, except medianly in front where it is deficient, is attached at its circumference to the pelvic walls, and yielding, if it is to occur, must do so centrally. The coccyx becomes more sloped downwards and forwards, and instead of being placed in a superficies at right angles to the line of impact, forms an inclined plane down which the vertex is pressed. When the forehead is posterior, it is easy to understand how it falls into line behind the advancing vertex and comes to occupy the middle line posteriorly; for the transverse diameters of the pelvis become diminished whilst the antero-posterior become increased as the outlet is reached. Thus the forehead is forced towards the hollow of the sacrum by the increasing pressure between it and the postero-lateral pelvic wall, a pressure which increases progressively as descent continues.

When, however, the forehead is anterior, the mechanism of its rotation posteriorly is more difficult. Cases, as we have seen, fall into two different types—(1) in which the head is well flexed; and (2) in which the head is not well flexed. In the first group the unfavourable position is usually corrected, in the latter usually remains uncorrected.

In these cases in which the head is well flexed, just as when the forehead is posterior (and the occiput anterior), the vertex first meets the pelvic floor in the region of the coccyx, which, as before, becomes

inclined downwards and forwards and forms a plane along and down which the vertex is pressed. The vertex, therefore, is forced to occupy a lower yet more anterior position; that is, it is forced to approach the symphysis. Owing to the direction of the coccyx being continued by the ano-coccygeal raphe further descent of the vertex can only occur in conjunction with its further projection forwards (*i.e.*, towards the symphysis). This can readily occur in occipito-anterior positions, for extension of the head is possible, and now begins. But in occipito-posterior positions (the head being well flexed), such movement is resisted by the chin already being in close contact with the fœtal chest; and thus the tendency for the vertex to advance towards the pubic arch compresses the forehead in a direction obliquely upwards, with a force proportionate to the force of descent, against the upper part of the antero-lateral pelvic wall, to which it was apposed before this movement began. Descent of the forehead is prevented by the projection forwards of the vertex, which its descent along the inclined plane of the pelvic floor has determined; for the forehead can only descend in this position by causing the vertex and occiput to retreat, a movement which the pelvic floor, against which the head is forced, tends to prevent. Nor can the forehead ascend towards or above the brim, for the same force which has thrust down the vertex thrusts the fœtal chest against the chin. Since the vertex cannot further descend if the forehead remains in this position, unless considerable moulding of the head and marked recession of the pelvic floor posteriorly (coccyx and ano-coccygeal raphe) occur, and since the transverse diameter of the pelvis is greater than the antero-posterior at this (comparatively) high level in which the forehead is placed, the latter is coerced to glide into the larger transverse diameter by the resultant of those same forces which would otherwise have determined the moulding of the head by compression. This it can do, for the part of the head opposed to the floor on account of the marked flexion of the head, presents almost as a segment of a sphere, the bi-parietal diameter measuring $9\frac{1}{4}$ cm., and the suboccipito-bregmatic $9\frac{1}{2}$ cm. (see Fig. 3). The movement of the forehead into the transverse diameter of the pelvis allows the cranial axial line (see Fig. 5), about which internal rotation takes place, to advance towards the symphysis, for the forehead occupies an eccentric position in relation to it; that is to say, the distance between the forehead and the cranial axial line is greater than the distance between the side of the head and the same line. This advance or projection forwards of the upper part of the cranial axial line, and the tension of the pelvic floor below, forcing the lower part of the cranial axial line similarly forwards, determines a lessened resistance between the side of the head facing the sacrum and the posterior parts of the pelvis than exists between the forehead and the lateral pelvic wall. Thus a

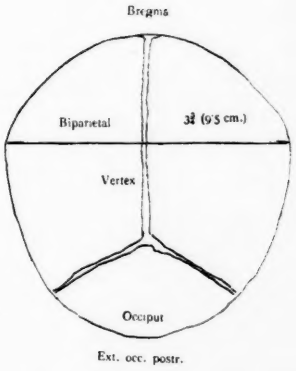

Fig. 3. Showing that the aspect of the fœtal skull, which is opposed to the pelvic floor in vertex cases, presents almost as a segment of a sphere, easily allowing internal rotation. Diagram (reduced) from Edgar's Obstetrics (p. 445). This author states the bi-parietal and suboccipito-bregmatic diameters are equal (9·5 cm.). The figures in the text (bi-parietal diam. $9\frac{1}{4}$ cm.) are those given by Bumm

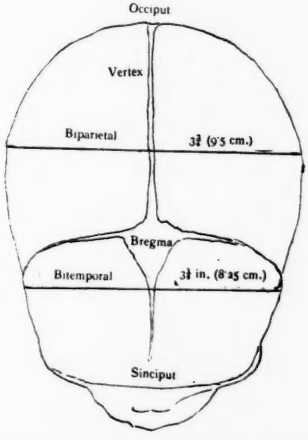

Fig. 4. Showing that the aspect of the fœtal skull, which is opposed to the pelvic floor in bregma presentations, is very far removed from a segment of a sphere, causing great difficulty in internal rotation or absolutely preventing it. Edgar gives the occipito-frontal diameter as 11·5 cm. The diagram (reduced) is from this author's obstetrics (p. 444).

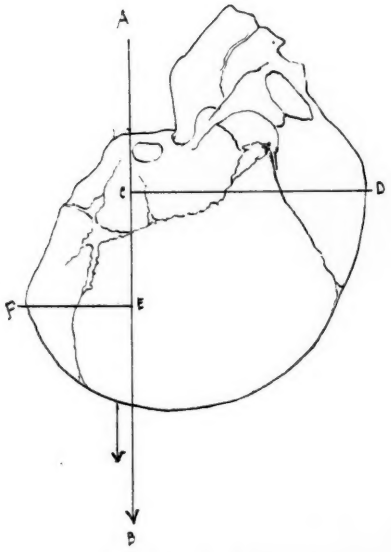

Fig. 5. Showing how the forehead is placed eccentrically to the cranial axial line. A B the cranial axial line, about which internal rotation takes place when flexion is good. When the vertex (B) is fixed by the force from above (acting along A B), the point D, coming into relation with the pelvic wall, acts as the flange of a screw.

continuance of the expelling force from above (uterine contractions) and the frictional resistance between the side wall of the pelvis and the forehead, in conjunction with a diminution of the transverse and an increase of the antero-posterior diameters of the pelvis, which occur as the region of the outlet is reached, determine a continuation of the rotatory movement so that eventually the forehead rotates into the hollow of the sacrum, whilst simultaneously the occiput turns to the front. With this screw-like rotation, descent of the head as a whole occurs, for the vertex is now able to advance and thus to descend.

That the forehead comes into such relation with the antero-lateral and later the lateral pelvic walls is shown by the following considerations:—

If a fœtal skull be taken and held in the position of extreme flexion, such as occurs in the cases in question, the line along which the driving force acts will pass from the anterior region of the foramen magnum (articular processes) to the vertex, a short way (half an inch or so) in front of the posterior fontanelle (see Fig. 5). If from this straight line, two other straight lines be drawn at right angles to it, the one passing backwards to the most distal part of the occipital bone (external occipital protuberance) (EF), and the other forwards to the most distal part of the forehead (CD), it will be found that the latter line is not only much longer than the former (more than twice as long), but is situated much higher up, *i.e.*, further away from the vertex (about $1\frac{1}{2}$ inch). Thus if equal tangential forces be applied to the extremities of these lines in planes at right angles to the axial line, *i.e.*, such as would cause a rotation, the one acting upon the forehead will have more effect in causing a rotatory movement than that acting upon the occiput, for the arm is longer. But whilst the projection of the occiput from the axial line is not greater than the other parts of the fœtal head at this low level, that of the forehead is maximal; the region of the vertex is approximately hemispherical, but the forehead is placed eccentrically to the axial line along which the force of descent acts, and its most distal centrifugal part acts as the flange of a screw.

For the screw-like rotation to occur it is no less necessary that whilst the advancing pole of the head be fixed and another part be placed eccentrically, that the pelvis also must be so shaped that when the well-flexed head is passed through it and its advancing pole is fixed, that its eccentric part should so come into relation with the lateral wall that it may be forced to glide circumferentially around it. This condition obtains in the normal female pelvis in which the transverse diameter of the brim is greater than the antero-lateral.

That the shape of the maternal pelvis is a necessary factor in causing this rotation is shown by the failure of this mechanism of

rotation to occur in cases in which the transverse diameter of the pelvis, near or at the brim, is not greater than the oblique, as is found in the small round pelvis (Herman [23]). In these cases the posterior position of the occiput persists, and the persistence occurs in spite of good flexion of the head. The reason of this is to be found in the fact that compression from above (uterine contraction) cannot produce tangential forces between the forehead and pelvic wall. The kyphotic pelvis is also stated (Edgar, *ibid*, p. 579) to be a cause of persistence of the occiput behind. In this variety of pelvis, the transverse diameter at the brim is not altered, or only slightly increased, but the conjugate at the brim may be considerably lengthened; so that the relation of these two diameters to each other is similar to that found in the small round pelvis, or the condition in the normal is actually reversed.

When, however, the head is not well flexed the same mechanism cannot occur. In this case, the part of the head that reaches the floor first is not the vertex, but an area much nearer the anterior fontanelle—bregma presentation. The forehead being much lower in the pelvis than when flexion is good, the occiput of necessity must be situated more posteriorly in the oblique diameter (*i.e.*, nearer the pelvic wall), and the pelvis being basin-like in shape (*i.e.*, the floor being a concavity and not a plane), the occiput must be higher up (*i.e.*, nearer the brim) than when flexion is good. As the fœtus is pressed downwards, the anterior inter-parietal region cannot so easily cause descent of the floor, because it is more obtuse than the vertex, and its descent is resisted by a correspondingly larger area of the pelvic floor. Descent, indeed, can only occur by the moulding which results from the approximation of the forehead to the occiput, and which occurs in consequence of the reflection of the impulses from the resistance of the lateral pelvic walls set up by the force of descent. The coccyx does not so readily form an inclined plane, can indeed only do so as the result of the descent of the head which the moulding makes possible; and the advancing pole of the head cannot, until considerably moulded, be pressed along it; for its advance is prevented by the apposition of the forehead against the *lower part* of the antero-lateral pelvic wall. Hence descent can only occur in conjunction with marked recession of the coccyx and the ano-coccygeal raphe. Moreover, it is to be noted that this part of the antero-lateral pelvic wall is here padded by the thick internal obturator muscle, which certainly will contract with the other leg muscles during the straining, and thus encroach on the already limited space. Nor can the lateral movement of the forehead so readily, or indeed at all, occur: because the transverse diameter of the pelvis at this level is less than that higher up; and further, because the diameters of the fœtal head concerned in such rotation are the bi-parietal $9\frac{1}{4}$ cm .as before, but the sub-occipito-bregmatic $9\frac{1}{2}$ cm. is replaced by the occipito-

frontal, 12 cm. (see Fig. 4). As a result of the continued onward pressure and the moulding of the head, the pelvic floor in its descent before the advancing head, becomes deepened by the exaggerated recession of the coccyx and its raphe, and being deficient anteriorly where the aperture exists, through which the presenting part of the head now projects, more space is available in the sagittal plane. Into this plane, therefore, the head is pressed, for a corresponding increase laterally cannot occur. In this position, when the head is of average size, delivery can only be accomplished by much moulding. The forehead becomes jammed against the symphysis, and the occiput slowly passes over the posterior commissure of the pubo-rectalis muscle and the superficial perineal parts. When it is born, the nape of the neck occupies the vulvar cleft posteriorly and the forehead is then pressed down past the symphysis and so the face appears and the head is delivered.

Thus the change from the occipito-posterior to the occipito-anterior position appears to be the result, not so much of the occiput being rotated forwards, as of the forehead being rotated backwards. The vertex, in the depths of the pelvis, is pinned against the pelvic floor by the force from above, and is comparatively fixed: it certainly is extremely difficult to impart any degree of rotation to it manually during a pain. The change from the one position to the other does indeed necessitate a rotation of the vertex, through which the axis of rotation, like that of descent, passes; but during this movement, which is much like a ball rotating within a closely-fitting cup, its excursion is small and is limited to its further descent and projection forwards in the sagittal plane, which the change in the position of the forehead allows: for descent and rotation are synchronous movements. The forehead, on the other hand, when the head is well flexed, has considerable excursive capabilities, being able to sweep around the pelvic wall to which it is apposed, from its primary antero-lateral position into the hollow of the sacrum. As the vertex, approximately maintaining its position in the sagittal plane, descends along the inclination into which the pelvic floor posteriorly is transformed by its passage, this circular sweep of the forehead is also accompanied by a movement of descent and is truly a screw-like rotation.

Since the pelvic floor maintains the vertex fixed centrally, and is the point d'appui around which rotation occurs, it plays an essential part in rotation. If the vertex met no resistance below it would deviate laterally and backwards, and the forehead instead of rotating would merely descend. This is what actually happened in Dubois' and Edgar's terminal experiments: the absence of sufficient resistance, *i.e.*, of central fixation, explains the failure of the head to rotate. Normally, however, the pelvic floor opposes the descent of the vertex with a force proportionate to, and caused by, the force determining

descent (uterine and abdominal wall contractions), thereby fixing it, and consequently the several forces reacting between the circumferential parts of the lower fœtal pole (head) and the pelvic walls with which they are in contact, come into play. When this factor is not present, as when the fœtal head is considerably smaller than the pelvic cavity or when it is not well flexed, or the pelvic diameters are approximately equal, this reaction of forces between the forehead and the pelvic wall cannot occur and internal rotation is not produced, the head being born in an oblique or transverse position.

Finally, these forces cannot come into play in the absence of a driving force: hence uterine activity is essential.

Thus the factors concerned in causing rotation are: (1) the expulsive force from above; (2) the obstructing, central fixing, force from below; (3) the shape of the pelvis; (4) the shape, size, consistence and position (flexion) of the fœtal head.

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Considerations on the Statics of the Pelvic Viscera and their Relationship to the Operative Treatment of Utero-Vaginal Prolapse.*

By G. A. Casalis, M.B., C.M. (Ed.),
Late President, Gynæcological Section, S. A. Medical Congress, 1908.

Part I.

Much has been said of late concerning the supports of the female pelvic viscera, a great deal more has been done as regards the surgical treatment of displacements of the same structures, but, if one is to judge by some recent contributions to the literature of the subject, in both cases with little prospect of anything like a consensus of opinion or uniformity of practice. Nor is it surprising that it should be so, for it must be admitted that within the short period of a few months both surgeons and anatomists seem to have undertaken the task of radically altering our former opinions, and removing misconceptions evidently still prevailing in our minds as to the true condition of things within the pelvic cavity. For instance, our long-cherished ideas as to the nature of the so-called ligaments of the uterus and their functions, so minutely described by past authorities, have been ruthlessly dashed to the ground. In this topsy-turveydom what used to be the round ligament is no more than a vestigial structure of little or no importance; what went by the name of broad ligament is merely a mesometrium, a peritoneal fold with so little consistence that it is a negligible quantity in the statics of the pelvic viscera.

Indeed, if we are to believe those surgeons who, day after day, behold these so-called ligaments lying on the pelvic floor in that specially limp condition suggestive of the proverbial wet rag, we should become as convinced as they are "that the structures which are generally supposed to hold up the pelvic organs do not perform the functions ascribed to them except in a very minor degree."[1] The pelvic fascia and its complicated layers, that "pons asinorum" of our younger anatomical days, has lost its entity, in fact, according to some authorities[2] there are no fascial layers at all, but a mass of connective tissue, "partly loose, partly dense," forming sheaths enclosing blood-vessels, nerves and lymphatics, and these perivascular layers, as they are called, rise from the side of the pelvis and become attached to the lateral aspects of the uterus, the vagina

* Read at the S. A. Medical Congress, 1909.

and bladder, and hold these organs in the position they occupy. The "ligamentum colli transversale," carefully dissected and demonstrated by Mackenrodt, is nothing but a condensed connective tissue covering of mesoblastic origin following the blood-vessels which supply the vagina and lower parts of the uterus. Kocks' "ligamenta cardinalia" share the same fate, and as for the "white line" (arcus tendinus fasciæ pelvis) which has lately been promoted to the office of chief support of the ligaments holding in position the various visceral organs,[3] we now learn that it is only the aponeurotic attachment of a degenerated pelvic muscle, the ilio-coccygeus, with as little consistence or permanence of attachment as the muscle to which it acts as tendon is subject to a wide range of variation in its size and power of contractility.[4]

The "levator ani muscle" that sheet anchor of modern plastic vaginal operations, we are told, has degenerated phylogenetically, and, with the loss of the tail as a movable organ, its glory has departed for ever. In fact, its two component parts, the pubo-coccygeus and ilio-coccygeus are "indeed mere faint adumbrations of the masses of contractile tissue, which subserve the locomotion of the prehensile ape and the tripod kangaroo."[5]

As for the perineal body, so beloved in days past by obstetricians, it has long ago been wiped out of existence and remains only as a name with no special significance. In face of these extensive and wholesale revisions of our anatomical notions, the practical surgeon may well ask what is left of the supposed supports of the pelvic viscera, with the round and true ligaments of the uterus gone, the pelvic fascia "a mere concentration of connective tissue with no definitiveness," and the pelvic muscles, at least the most important one, reduced to the rôle of an ordinary sphincter, and what is to be done, when under the mysterious influence of that all powerful force, the intra-abdominal pressure, the uterus and its adjoining structures are shelled out of their recess and become herniated through the vulval aperture. This is the question to which, without overburdening the subject with the description of minute anatomical points, or the quotation of various opinions as to the causation of things, we shall attempt to give as practical an answer as possible.

I. Anatomical Considerations.

Perhaps the best way to attain our aim would be at first to consider as a whole the general architecture on which the pelvic region has been built, and thus obtain, to use a French expression, "Une vue d'ensemble," which alone can assist the student to grasp fully the different positions assumed by the pelvic organs and the relationship they bear one to another.

Pelvic Cavity. We may therefore, with Petit,[6] describe the pelvic cavity as surrounded by an osteo-fibro-muscular wall, cylin-

drical in shape, with a wide inlet above, and a narrow outlet at the base, the latter being further practically closed by a fibro-muscular floor or diaphragm. The walls of the cavity itself are formed by the sacral and pelvic bones, reinforced by the greater and lesser sacro-sciatic ligaments, and are lined on their internal surface by the obturator internus and pyramidalis muscles, and their aponeurotic covering, and also, sweeping from back to front, *i.e.*, from the sacral to the pubic bones, by the perivascular hypogastric sheaths accompanying the plexus of the internal iliac vessels.

The Pelvic Viscera. Lying within the boundaries of this osteo-fibro-muscular and vascular cavity, and resting partly on its sloping walls and partly on the median portion of its fibro-muscular floor, are the pelvic visceral organs, which, in the female, consist of the bladder, uterus and appendages, vagina, ureters and rectum. These organs may be described as composed of four distinct superimposed layers of tissues and except for the mucous one, in direct continuity with the structures forming the pelvic floor.

(*a*) A peritoneal layer reflected from the parietal peritoneum and continuous with that lining the pelvic diaphragm.

(*b*) A fibro-cellular layer corresponding to the so-called visceral fascia, but which, as pointed out by Derry, is "the remains in this mesenchymatous form of the tissue in which the viscera originally developed." This layer is continuous on the floor and on the sides of the pelvis with the rest of the subperitoneal connective tissue with which it intermingles freely.

(*c*) A muscular layer, furnishing the contracting element to the viscera, and by means of unstriped muscular fibres, travelling along certain well-defined paths of the adjoining connective tissue to the so-called true ligaments. Thus the longitudinal fibres of the anterior rectal wall send muscular prolongations to the so-called perineal body, the uterine muscle to the round, the utero-pelvic and the utero-sacral ligaments, while the bladder sends off a few fibres to the pubo-vesical ligaments. This infiltration of the connective tissue, surrounding and partly supporting the visceral organs, by unstriped muscular fibres, explains why, as pointed out by Petit,[6] there cannot be visceral involution without the same process affecting also the muscular portions of its supporting elements; in other words relaxation and absorption of the unstriped muscular fibres of the urogenital canals, invariably means also relaxation and subsequent sagging of the perivascular sheaths, and conjointly of the subperitoneal and subvisceral connective tissue of the upper pelvic segment.

(*d*) Finally a mucous layer unconnected with any other layer of the pelvic viscera or pelvic floor.

The pelvic floor. Situated immediately beneath the viscera, which it partly surrounds and partly supports, is the pelvic floor or

diaphragm. It is also composed of four distinct layers bearing the same relationship to one another as those of the viscera, viz.:—

(*a*) A serous or peritoneal covering reflected from the parietal and visceral layers, and except at the lower portion of the recto-uterine pouch loosely connected with the subjacent fibro-cellular layer.

This looseness allows the peritoneum to be thrown into folds, thus dividing the pelvic cavity into segments or logias, and forming, particularly on the lateral pelvic surface, where it invests the peri-vascular hypogastric sheaths, a true mesometrium for the uterus, just as the mesocolon forms by its two peritoneal folds a mesentery to the intestine.

(*b*) A fibro-cellular layer continuous with the visceral connective tissue, and characterised by its tendency to form fibrous layers, investing the pelvic blood-vessels and acting also at the same time as fibrous attachments to the viscera. "Part of this tissue is loose and part dense," the denser portions condensing in places to form the definite ensheathing layers just mentioned, while the loose portions, composed mainly of adipose tissue, may be considered as a sort of cement to the rest of the tissues they infiltrate, thus converting the whole mass of the subperitoneal connective tissue, into one solid plastic body encasing the viscera, with its accompanying muscles, blood-vessels, lymphatics and nerves.

The most important portion of this fibrocellular layer corresponds to the lateral masses of tissue already fully described elsewhere, which extend between the sides of the pelvis and the lateral aspects of the uterus, vagina and bladder, and which, together with the bundles of the unstriped muscular fibres which accompany them, are in reality the true supports and ligaments of the genito-urinary organs.

(*c*) A muscular layer composed of two sets of muscles "morphologically and functionally different one from another" (Thompson), but with one common feature, which is that each muscle is provided with an aponeurotic fascial covering, forming a thin connective-tissue sheath for the less developed ones, and a strong, well-marked, retentive sheath for the others, thus leading to the formation of fascial layers of lesser or greater density according to the development and activity of each individual muscle.

The more internal layer of muscles is the most powerful and consequently the better supplied with fascial covering, the latter being specially conspicuous over the origin of the anterior pubic portion of the levator ani proper. This muscle, together with the ischio-coccygeus, is the representative in the human subject of the tail-moving muscles of the lower animals, but which through evolution has somewhat readjusted its character and attachment, by sliding

"forward and downward" so as to conform to its new function of closing the pelvic outlet and supporting the pelvic contents.

The external layer of muscles controls the orifice of the canals which pass at right angles through the rest of the structures constituting the pelvic floor and meet at a central point of convergence, forming part of the so-called "perineal body" or central part of the perineum.

(d) Finally, a cutaneous layer with its superficial subcutaneous fascial structures serving as a support and external covering to the pelvic outlet.

THE STATICS OF THE PELVIC VISCERA.

If we accept the preceding anatomical notions as being the correct interpretation of things as they "really are" within the pelvis, we may, with comparative ease, grasp the relationship of the different pelvic visceral organs to their so-called mechanical supports.

First. It is evident that the so-called ligaments of the uterus, except for the round ligaments, do not exist as distinct and well-defined entities, but must be regarded only as part of that somewhat intricate structure known up to now as the pelvic fascia. The composite nature of these structures explains their easy dissection from below or above as the case may be, their unreliability from a surgical point of view as supporting agents to the uterus, once part, or the whole of their various tissues have been relaxed, absorbed or destroyed. It also explains the curious anatomical fact that while the ligaments, taken as a whole and in their entirety, do exist as specific structures, (which, owing to the presence of their unstriped muscular fibres, are endowed with special contractile virtues), the intricate intermingling of the fibrous perivascular sheaths of which they are mainly composed with the rest of the parietal and visceral fascial layers covering the pelvic muscles, renders, as pointed out by Derry, all attempts to give them any definitiveness artificial, and makes their description unnecessarily complicated and confusing. For, though well-marked on the sides of the uterus and vagina where they are inserted, and on the lateral posterior surface of the pelvis from which they arise, they are not so elsewhere, and specially in the case of the broad ligaments, their lower attachments seem to pass gradually into the mass of the loose connective tissue at the base of the pelvic cavity and are "no more traceable."

That, together with their peritoneal covering, and specially their strong perivascular sheaths, they form a better developed and more efficient uterine support than they are generally credited with, can be easily ascertained experimentally as well as clinically.

In the former case, every surgeon in the habit of performing vaginal hysterectomy knows by experience that even after the section

of its vaginal insertion and the opening of both peritoneal cul-de-sacs, the uterus cannot be removed until the wedge-shaped pieces of tissue at its sides have been clamped and severed, nor is the anterior *basculment* of the fundus and the descent of the uterine body easily obtained unless its basal ligamentary connections are both flexible and extensible. As soon as they cease to be so, as in cancerous and fibromatous infiltrations, vaginal hysterectomy becomes as hazardous an operation as it is difficult.

Further, the clinical features presented by a woman with extensive vaginal and perineal tears and apparently no vestige of support from the "levator ani" but still with an anteverted and normally sustained uterus, are of sufficient frequency to prove beyond doubt that although the chief supports of the pelvic viscera are undoubtedly its muscular and fascial diaphragm, the part played by both the utero-pelvic and sacro-uterine ligaments, so far as the uterus itself is concerned, is probably of equal importance. As fully demonstrated originally by Mackenrodt, and lately by Dr. Ella Ovenden, "coming as they do from the postero-lateral part of the pelvic wall," these ligaments "hold the supra-vaginal portion of the cervix in a firm grip, but with a pull acting in a slightly backward as well as lateral direction, and this latero-posterior force combined with the intra-abdominal pressure and weight of the uterus itself," tends to preserve the normal anteversion and anteflexion of the uterus and to prevent as well any downward tendency. As for the round ligament, although a vestigial structure, the presence of the striped and unstriped muscular fibres entering in its composition, leaves little doubt as to its evolution and the rôle it is called to play in the statics of the uterine body. Its true function, however, only begins with gestation. Both ligaments may then be felt as a pair of taut cords, stretched over the anterior surface of the pregnant uterus, of which they direct the ascent, while after labour they facilitate by their steady contraction the uterine involution, and thus become, what they have really been intended by nature to be, real gubernacula uteri.

In spite, therefore, of what has been said to the contrary, the action of the round ligament on the non-pregnant uterus, as the very sinuosity of its course in the pelvic cavity fully suggests, is a limited one, and although it cannot be denied that, together with the broad and utero-sacral ligaments, it assists in keeping the uterus in its forward position, the main responsibility of doing so lies with that most conservative of forces we call the intra-abdominal pressure. The latter acting "on a solid and rigid organ like the uterus, whose natural curve has been obtained by its growth in a limited cavity like the fœtal pelvis," and by the fact that it lies over a dilatable and frequently convex viscus like the bladder, keeps the uterus in a forced anteverted position, from which it is only dislodged when, through accident or the destruction of its lower attachments, its axis

becomes altered in direction, and the fundus is made by the same intra-abdominal pressure to assume a position directly the reverse of its normal one. Further, whatever action the round ligaments may have as tow lines to prevent an excess of movement on the part of the uterus, what seems beyond dispute is that they have no direct supporting action on the uterine body itself. Consequently, if the latter be much enlarged and retroplaced, especially if the utero-sacral or utero-pelvic ligaments be also relaxed, very little benefit can be expected to follow their shortening.

The numerous operations devised to correct backward displacement when associated with partial descent or undue enlargement of the uterus, are therefore anatomically and physiologically faulty if they rely on the simple shortening of these structures to obtain permanent results.

Second. If, therefore, we come to look upon the ligaments of the uterus as being part and parcel of the uniform and plastic mass, which surrounds and invests on all sides the organs lying upon the fibro-muscular diaphragm closing the pelvic outlet, "we must, to be consistent, include in the term pelvic floor," all the structures which are embedded in this mass of heterogeneous tissue, and are to be found between the peritoneum of the pelvis and the skin of the perineum, "that is they include also part of the viscera." (Paramore.)

This is unquestionably what should be done, and such a view would not only be anatomically correct, but would greatly tend to simplify matters.

Thus, for instance, the discussions as to whether the uterus is a suspended or supported organ would become meaningless and have only an academic interest. The uterine body is as much suspended as it is supported; suspended by the lateral masses which constitute its mesometrium, and supported by the same structures which, spreading on the median portion of the pelvic floor surround it on all sides, and in which it is inserted and practically encased. The same applies to the bladder, this viscus being in reality "embedded within and completely surrounded by the connective tissue which permeates its surface from all sides and separates it as well from the limiting osseo-fibro-muscular walls of the pelvis proper." (Paramore.)

With these anatomical notions clearly defined, we may therefore, with Paterson, regard the pelvic floor as divided into two portions: An anterior or pubic segment containing the genito-urinary passages, supported by muscular and strong aponeurotic attachments and characterised by its firm fixation to the pubic arch: A posterior or sacral segment composed of the rectal and anal channels, surrounded by a loose fascial connective tissue covering and supported by a

strong muscular layer, whose main character is its *elasticity and distensibility*.*

In the erect posture the pubic segment is the first to feel the effect of the intra-abdominal pressure, acting from above downwards, but owing to the anteflexed and anteverted position of the normal uterus, which generally speaking may be said to lie at right angles to the brim of the pelvis, the line of resistance is deflected at its base towards the sacral segment and in particular to the central part of the perineum, the so-called perineal body, which may be considered as a bracing point of much of the musculature of the pelvic floor, and thus the ultimate and chief support of the pelvic viscera.

Considered as a whole the structures supporting the genito-urinary organs in the female, may not be incorrectly divided into a series of superimposed planes, or girths stretching from one side of the pelvis to the other, intimately connected with each other, acting synchronously and depending on each other for the maintenance of the resiliency and contractibility of their respective elements.

The first sling is mostly a uterine one, being peritoneal, fibro-muscular and vascular. Its main action is to prevent the backward and downward displacements of the uterus and its appendages and to maintain the organ in a forced anteverted position, thus keeping its fundus in close apposition to the bladder walls and through them well supported by the strong fascial and muscular elements of the anterior pubic segment.

The second sling is a fibro-cellular one. It gives additional support to the structures forming the first girdle, but more especially to the bladder, ureter and upper part of the vagina.

The third sling is purely a fibro-muscular one, and is intimately connected with the second one, receiving from it special support by means of the fascial prolongations which ensheath and give attachment as well to its numerous muscles. This girth has a double action, accomplished by a different set of muscles; one which is to give the

* Berry Hart ("Anatomy of the Female Pelvic Organs," System of Gynæcology, Allbutt, Playfair and Eden, 1906, page 41), says exactly the contrary. According to him, "The pelvic floor can be divided into two portions—an anterior pubic mobile segment, and a posterior more fixed or sacral segment. The pubic segment consists of bladder, urethra, and anterior vaginal wall. Its mobility is due not only to the less firm nature of its tissue, but also to its loose attachment to the pubes.

"The sacral segment is firmly attached to the sacrum, and consists of the tissue behind the posterior vaginal wall, which is included in it (the so-called perineal body). In the upright posture the sacral segment is the supporting one, intra-abdominal pressure pressing the pubic segment against it."

It is difficult to see how Berry Hart can reconcile his views with the fact that, in labour, the pubic segment remains practically stationary, while the sacral is pressed backwards and dilated beyond recognition during the passage of the fœtal head through the vulval orifice—hence all the lacerations and injuries to the pelvic floor are found in the posterior or sacral segment—and practically none in the other.

—From "S. A. Medical Record," a paper by the Author.

final and strongest support to the first two slings, and the other to close effectually by a sphincter-like action the canals that pass through it. These, however, do not impair the strength of the pelvic floor, as especially in the case of the vagina and urethra, they are mere slits passing through a practically unbroken fibro-muscular layer and at right angles to the direction of the intra-abdominal pressure. Considered in this light, it is manifestly illogical to apportion the burden of supporting the pelvic viscera to one set of structures more than to another, or to extol the action of one sling to the detriment of the two remaining ones. In health, no doubt, in the resistance they offer to the ever-varying effects of the intra-abdominal pressure, a force which it is as difficult to gauge as it is to regulate, they act as much one as the other, although in the matter of final resistance the muscular girth, owing to its greater elasticity and power of alternate contraction and relaxation, would always outlast the two others.

To quote, in a somewhat modified form, from a recent writer,[7] " it is only in virtue of the inherent peculiarity of striated muscle, that of marked extensibility and of subsequent recontraction of its fibres, that the pelvic diaphragm, consisting of the levator ani muscle and its superimposed layers of connective tissue, can remain the highly elastic obturator it is, capable not only of a considerable movement in the cranio-caudal direction," but also of successfully resisting and accommodating itself to the variations of that complex force, called the intra-abdominal pressure.

(To be continued.)

The Age of Onset of Menstruation in Egyptian Girls.

By (Mrs.) B. Sheldon Elgood, M.B. (London), L.S.A.,
Assistant Medical Officer, Ministry of Public Instruction, Cairo.

The authorities I have consulted on this subject, hold divergent views with regard to the age at which menstruation appears in Egyptian girls. Kelly, for instance, (*Medical Gynæcology*, 1908, p. 83), gives a quotation from Engelmann (*Trans. American Gynæcol. Society*, 1901, vol. xxvi, p. 77) to the effect that in the North American Continent, climate has practically no influence on the onset of menstruation, which Engelmann places at the age of 14·2 years for the educated and 14·3 years for the uneducated classes. He considers that race also has very little influence, but mentality, surroundings, education, and nerve stimulation, stand out prominently as the factors which determine precocity in America.

Kelly, however, states that there is a wide difference between countries with regard to the age of first menstruation: he instances 18 as the age in Lapland, and 8 to 10 as the age among the aborigines of Australia and natives of Southern Prussia, Egypt, Servia and Sierra Leone. He adds that this difference has always been ascribed to the climatic effects of heat in hastening, and cold in retarding the onset of menstruation, and that the evidence in the main undoubtedly supports this view.

Hart and Barbour (*Manual of Gynæcology*, p. 93) place the age of first menstruation in England between the ages of 13 and 15. They believe that although the onset is said to be earlier in warm countries and in delicately nurtured girls, yet the observations of medical women in India—mainly those of the late Dr. Pechey Phipson—have shown that early onset is not the rule there, but that menstruation begins at the same age as in temperate climates.

Herman (*Diseases of Women*, p. 513) looks upon 14 as the usual age for the first menstruation, and is not satisfied with the evidence of early onset in hot countries. He considers that the question has not been so extensively investigated in hot countries as in Europe. According to him, the early onset, if it occurs, is mainly due to premature sexual stimulation being more common in the South than in the North.

This interesting uncertainty of opinion led me to investigate in the years 1906 and 1907, the menstrual history and actual state of 275 girls, between 6 and 16 years old, attending a boarding and day school for native Egyptian girls in Cairo.

The following table gives the results of this investigation:—

TABLE I.

Class	Number of pupils	Age	Number menstruating	Age of onset
I.	21	5—7	0	—
II.	63	7—9	0	—
III.	78	8—11	0	—
IV.	51	8—12	0	—
V.	25	10—16	8	3 at 12 5 at 13 and later
VI.	22	11—18	16	4 at 12. 12 at 13 and later
VII.	3	15—19	3	13 and later
VIII.	8	13—21	7	13 and later
IX.	4	16—20	3	1 at 12 2 at 13 1 not menstruating at 18

[NOTE.—An exact table of averages could not be prepared, since no exact record was kept of any case in which the onset had taken place after the age of 13.]

The table shows clearly that no child began to menstruate before the age of 12, that only 8 had their periods at that age, that in the majority the onset occurred at 13 years of age or after, and that some girls did not menstruate till the age of 16 or even later.

The children belonged to the well-to-do classes, living comfortably in the harems. They had simple drill and quiet games at school, but, athletically, they were not to be compared with English girls in modern schools. Indeed, life at an Egyptian school is more sedentary than life in the harems, as at home the girls play about in the spacious houses and yards until 16 years of age, and it is unlikely, therefore, that the onset of menstruation in their case has been retarded by the conditions at school, which resemble European conditions more closely than does life in harems.

The result of this first investigation, therefore, is that apparently the warmer climate of Egypt does not cause an early onset of menstruation. I was able to get confirmatory evidence of this fact in my private practice, for I learnt that 13—14 years were considered the ages at which menstruation usually set in, though no alarm was felt by an anxious mother when it was delayed till the age of 15. One or two girls, it is true, told me that they had menstruated at 11, but I never obtained any confirmatory evidence of this.

I next examined the girls of 3 other boarding and day schools for Egyptian girls. In these, the birth certificates were obtainable, and as many girls had passed several years at the school, their own

accounts could be checked by the evidence of the European matron and resident trained nurse.

The results may be briefly stated as follows:—

Of 295 girls between the ages of 6 and 11, not a single one had menstruated.

Of 143 girls between the ages of 12 and 18, 81 had menstruated and 62 had not.

The ages of onset in those who had menstruated is shown in the following table:—

TABLE II.

12	menstruated	at	12	years of age.
44	,,		13	,,
21	,,		14	,,
4	,,		15	,,

The following table shows the ages of the girls who had not menstruated:—

TABLE III.

18	had	reached	12	without	menstruating.
33	,,	,,	13	,,	,,
6	,,	,,	14	,,	,,
2	,,	,,	15	,,	,,
1	,,	,,	16	,,	,,
2	,,	,,	17	,,	,,

My first results are confirmed, for the table shows that a certain number of girls menstruate at 12, that the large majority begin at 13 and 14, and that menstruation may be delayed until 16, and even 17, without the delay producing abnormal symptoms. Indeed, I have under my observation at the present time a native girl who, at 18 years of age, has had one period only, and who is otherwise perfectly healthy.

On the other hand, I have seen lately a native child 11 years old, who, much to the parents' surprise, had begun to menstruate. I have also been told of another native child, who menstruated at 10 and was delivered of a child one year later. I have never myself observed such a child, and my experience suggests that such cases are as exceptional in Egypt as they are in Europe.

It is undoubtedly true that the age of marriage is earlier in Egypt than it is in Europe, but, nevertheless, the marriage of girls seldom takes place before the age of 14, the usual age among people comfortably off being 16 to 17. And, moreover, whenever menstruation is not fully established, it is well understood that the young wife does not leave her mother's care until menstruation has become regular.

SELECT CLINICAL REPORTS.

(Under this heading are recorded, singly or in groups, cases to which a special interest attaches either from their unusual character or from being, in a special sense, typical examples of their class).

I.

Some Observations on a Case of Excessive Hydramnios.

By W. J. Caie, M.A., M.B., B.Ch., Bury St. Edmunds.

The following case of hydramnios appears to be worth recording on account of the very large quantity of amniotic fluid present and the complications to which it gave rise.

History of the case. Mrs. M., a somewhat anæmic but otherwise healthy secundipara, aged 26, sent for me about the beginning of what she thought was the sixth month of her pregnancy on account of "a severe pain in her back and left side," which, she averred, prevented her from lying down in bed and kept her awake night after night. She also complained of much sickness and a more than usually "weighty feeling about her stomach," and said that she "felt quite different from what she did when carrying her previous child."

On examination, I found that the fundus uteri was well up to the ensiform cartilage and that various pressure symptoms were well marked. There were much œdema of the feet and legs, dyspnœa on the patient's attempting to lie down, and irregularity of the cardiac action with loud mitral and pulmonary bruits. The pain referred to was confined to the left side, about the level of the lower dorsal vertebræ, shooting round towards the umbilical area. The abdomen was very tense and dull all over, and no fœtal cardiac sounds were audible.

Per vaginam, nothing of note was observed, except that ballottement was very well marked. The urine was somewhat scanty and was found to contain a trace of albumin. I may say here that, from the history of the last menstruation and the date of quickening, I surmised that the patient was in her seventh and not her sixth month of pregnancy, which supposition was afterwards found to be correct.

Light diet, a laxative mixture and an opiate were prescribed, and during the following week all the symptoms except the dyspnœa were, if anything, somewhat less marked.

About a month after the date of my original visit, I saw the patient again and found a pronounced increase in the severity of the symptoms mentioned. She was now totally confined to bed because of the very œdematous condition of the lower extremities, had the very greatest difficulty in micturition, on account of much œdema of the vulva, and was emaciated, while the facial expression, as has often been observed in cases of hydramnios, was similar to that of an ovarian case (Kidd), the heart sounds were irregular and intermittent, and there was complete orthopnœa; the urine was very scanty and highly albuminous, and the pain above referred to was severer and almost constant.

Owing to the urgency of the symptoms I decided, after consultation, to bring on premature labour. At 11 a.m., I attempted to pass a gum elastic bougie into the uterus, but failed owing to the very œdematous condition of the vulva; two small trocars were therefore inserted, one in each labium, and, at 2 p.m. the œdema had become so much less that I found it less difficult to get my two fingers into the vagina and pass a couple of sterilised bougies between the uterine wall and the membranes.

Fortunately, pains came on in less than an hour, and at 5 p.m., when the os had dilated to about the size of a shilling, I punctured the membranes with a fine knitting needle. The liquor amnii drained away till about 7-30 p.m., and the total amount saved by the nurse reached the extraordinary amount of 480 oz. In addition to this there was lost I should say—taking a low estimate—another 40 oz., making altogether 520 oz. or about 26 pints. Pains then were regular, but somewhat feeble, and owing to the general condition of the mother being somewhat unsatisfactory, chloroform was administered and, with the aid of the forceps, a nearly full-time, dead female child was born about 8 p.m. The third stage of labour was normal.

After pains were of a most intense character and continued for four days, during which the temperature rose to about 100° on more than one occasion. A troublesome complication of the puerperium was the development on the abdomen and inner side of the thighs, of an urticaria of a very irritating and persistent type. On the eighth evening the patient had a rigor with a rise of temperature to 104°. A full dose of Quininae Sulph. and Pulv. Jalapae Co. half a drachm were administered and, next morning, the temperature was normal, after which convalescence was uneventful, the patient getting up on the 15th day. The lochia, though somewhat profuse, were never offensive and entirely ceased in the third week.

The amount of fluid which constitutes hydramnios or dropsy of the ovum cannot be stated in so many ounces or pints, but the condition is usually considered to exist when the amount of the liquor amnii is so great, that it produces morbid symptoms by its distension of the uterus, pressure on the abdominal or thoracic viscera, or the

fœtus (Haultain, *Handbook of Midwifery*). The average amount, however, in normal labours, is said to be about two pints, and anything over five pints is excessive (Jellett, *Practice of Midwifery*). Twenty pints is mentioned as a record by one writer, while an American writer states that it has been known to reach the enormous quantity of six gallons (Wilson, *American Journ. of Obstetrics*, Jan., 1887). It is said to occur in a more or less amount in from 1 per cent. to 5 per cent. of pregnancies.

As regards the etiology of hydramnios nothing seems to be definitely settled. By some it is stated to be due to an over secretion of liquor amnii, or to a deficient absorption; by others it is ascribed to a morbid, maternal, or fœtal condition, or both (Hirst, *Text-book of Obstetrics*). One writer (Fehling) asserts that the condition is associated with a thin state of the maternal blood, and Hirst states that a lymphagogue has been found in the liquor amnii of hydramnios which is not present in the normal liquid, and that this substance stimulates a serous exudate from the maternal blood.

The theory that hydramnios is entirely of fœtal origin seems to explain a large proportion of the cases, but in a considerable number nothing abnormal can be discovered in either mother or fœtus as in the case under discussion. Syphilis, cirrhosis of the liver, an abnormally twisted velamentous insertion of the cord, giving rise to increased blood pressure, stenosis of the umbilical vein, tumours of the placenta, valvular heart disease, have all been given by various writers as contributory causes, and it is believed by some that the excessive secretion of urine by the fœtus is the one and only cause which, however, would seem to be disproved by analysis.

On analysing the fluid in the present case I found it to be alkaline in reaction, specific gravity 1010, and to contain urea, albumin, and many epithelial scales and various salts.

In the treatment of this case the chief difficulty was experienced at the point where it was decided to bring on premature labour, from the excessively œdematous condition of the vulva. Even after the introduction of the trocars and subsequent draining of the labia, the passage of the bougies into the uterus was somewhat difficult, and the same condition gave trouble in the application of the forceps.

The passage of the trocars, bougies and knitting needle was performed under the strictest antiseptic precautions, and, as I have stated, no trouble resulted.

The various complications of the pregnancy, labour and puerperium were all due to pressure directly or indirectly; thus, the intense pain complained of at my first visit was probably due to pressure on the solar plexus, while the albuminuria, dyspnœa, œdema, etc., were to be ascribed to the same cause. The urticaria on the abdomen and thighs was a somewhat unusual occurrence,

but one writer (Norman Walker, *Introduction to Dermatology*) states that urticaria is sometimes caused by uterine or ovarian disease, on the analogy of which, the reflex irritation of the skin from the hydramnios in this case might be explained.

It may be noted that the fœtus was born dead, though death was quite recent, was of the female sex, but was not deformed in any way. The percentage of still births in cases of hydramnios is given as 15 (McClintock) and those born of the female sex as 75 (McClintock), while 25 per cent. are said to be deformed (Edgar).

II.

Nephrectomy and Ovariotomy during Different Pregnancies in the Same Patient.

By Marion B. Andrews, M.B., B.Ch.,

Senior Surgeon to the Women's Department, Ulster Hospitals, Belfast.

Mrs. E. S., a small, delicate looking woman, aged 32, came to see me at hospital in April 1907, complaining of acute pain on the right side of the abdomen and back for over a week.

History. Four years previously her right kidney was removed while she was four months pregnant with her fifth child. She went to term, and has had three children since, without any trouble during pregnancy or puerperium. At her last confinement the nurse told her she "had a tumour and must consult a doctor." This she neglected to do, and was now, by her own reckoning, seven months pregnant.

Examination. A cystic tumour the size of a fœtal head was found on the right side of the abdomen, and the uterus lay to the left and reached to about an inch above the umbilicus. Both face and legs were slightly œdematous, and the urine was said to be scanty, but no trace of albumen could be detected.

Progress. A few days later vomiting, with increase of pain, set in, and the patient was admitted for operation. No albumen could be found, and a cryoscopic examination kindly made by my colleague, Dr. Houston, showed an index of 1·7.

At the operation I removed a unilocular cyst containing about three pints of clear fluid. There was no twist of the pedicle, and no appearance of peritonitis.

After the operation the pain continued, and the pulse ran up to 144 next day, without however either rise of temperature or tenderness of the abdomen.

Vomiting was severe and continued for fifty-four hours, becoming hæmorrhagic before it was stopped, apparently by the administration of copious alkaline drinks.

About seventy-five hours after the operation a male child was born spontaneously and without warning. It was small, but the nails reached to the ends of fingers and toes, the testicles were completely descended, and the child had every appearance of being full-time.

Both mother and child left the hospital a month later, in good health.

Five months later the patient returned, and was found to be again pregnant, her tenth child being born within a year from the ovariotomy. During this pregnancy the urine was again repeatedly examined, but albumen was never detected, and there were no untoward symptoms.

In March and June, 1907, articles were published in this JOURNAL by Spencer Sheill and J. Haig Ferguson respectively, laying stress on the grave danger of a pregnancy following nephrectomy. Ferguson advised that after this operation patients should postpone marriage if possible till after the menopause. Sheill sterilised his patient after terminating her third pregnancy prematurely for toxic symptoms. Both agree that at anyrate an interval of three or four years is necessary to enable the remaining kidney to hypertrophy sufficiently for its increased duties.

That my patient had no break down under the stress of five rapidly succeeding pregnancies (one each year), may be due to the fact that in all probability the right kidney was functionally inactive for some time before its removal. The surgeon who removed it kindly replied to my enquiry as to its condition—"It was a case of movable kidney with hydronephrosis. I did not intend to remove it, but it bled so freely on exploration and was so friable that I had no choice."

It may be also that hard work on starvation diet tends to keep down the production of toxins. At any rate it may be of interest, eugenically, to note that in addition to bearing ten full-time children and undergoing two major operations in thirteen years, Mrs. E. S. is the chief—and frequently the only—bread-winner for the family.

III.

A Case of Complete Rupture of the Uterus Treated by Abdominal Hysterectomy.

By Arnold W. W. Lea, M.D., B.S., F.R.C.S.,
Lecturer in Obstetrics and Gynæcology, Manchester University; Assistant Surgeon to St. Mary's Hospital.

Rupture of the uterus is one of the gravest accidents of labour and its treatment must always be a question of much importance. The mortality of cases treated by conservative measures, such as evacuation of clots, the use of an abdominal binder and gauze packing through the vagina, is high and, according to the statistics of Klein, Koblanck, Ivanoff, Munro Kerr, Petrén, and others, amounts to from 60 to 80 per cent. Although many cases of rupture involving the lower segment only, or extending into the broad ligament, recover under these modes of treatment, they are quite inadequate in complete rupture of the uterus involving the general peritoneal cavity. The value of surgical measures in severe cases of rupture of the uterus has been conclusively shewn and, although the operation is inevitably attended with considerable risk, many lives can undoubtedly be saved by prompt action.

At St. Mary's Hospital during the last three years five cases of rupture of the uterus have been treated by abdominal hysterectomy with three recoveries. These cases were briefly recorded by Dr. Fothergill at the May Meeting of the Obstetrical Section of the Royal Society of Medicine.

The following case, which occurred recently, affords another example of complete rupture of the uterus treated by abdominal section with good results.

In this instance the indications for operation were clear as the fœtus had been expelled from the uterus and lay in the abdominal cavity. The notes are as follows:—

Mrs. D., age 36, secundipara, was admitted into the St. Mary's Hospital on the morning of June 28, 1909, having been in labour for 36 hours and after repeated attempts had been made to effect delivery by forceps. Her two previous labours had been tedious, the child in each case being extracted by forceps. Both children survived.

Labour pains commenced on the evening of June 26 and continued throughout the next day. They were feeble in character and attended by constant nausea with vomiting.

The membranes ruptured spontaneously at midnight on June 27.

As no progress was made, the medical man in attendance applied forceps at 4 a.m. on the 28th; the head being above the brim. Repeated attempts were made to effect delivery under anæsthesia, but without success.

Shortly afterwards the patient was observed to be very ill with marked pallor and increasing rapidity of the pulse, together with slight hæmorrhage from the vagina. She was, therefore, transferred to Hospital in an ambulance.

On admission at 10-30 a.m. the patient was suffering from severe shock, the pulse being 144 to the minute and felt with difficulty.

The abdomen was extremely tender and irregular in outline. On palpation the shoulders and limbs of the fœtus were plainly felt just beneath the abdominal wall on the left side. The head could be made out distinctly lying above the pubes. A firm mass occupied the right side of the abdomen, which appeared to be the body of the uterus. The vagina contained a quantity of blood clot, and the cervix was extensively torn anteriorly. The fœtal head could be made out lying above the pelvic brim.

A catheter was passed into the bladder, and two ounces of blood stained urine were withdrawn.

A diagnosis of complete rupture of the uterus was made, and, as the patient was profoundly collapsed and evidently suffering from internal hæmorrhage, immediate operation was decided upon.

On opening the abdominal cavity, a full term fœtus was found lying amongst the coils of intestine, the head resting upon the promontory of the sacrum. The child was removed, and the placenta which had been completely expelled from the uterine cavity was also taken away.

The peritoneal cavity contained a large quantity of blood and clots.

It was now seen that the anterior wall of the uterus had been completely torn transversely, just above the peritoneal reflexion of the bladder, the tear extending into the left broad ligament, and through the large rent the fœtus had passed into the abdomen.

The uterus, together with the appendages, was rapidly removed by clamping the upper portions of the broad ligaments. The lower part of the cervical canal, which was widely dilated and torn, was inverted towards the vagina, and the peritoneum was completely sutured over the stump. The abdomen was closed without drainage.

The vagina was thoroughly cleansed and gauze packing introduced into the cervix.

During the operation 40 ounces of saline fluid were transfused into the basilic vein, and this was further supplemented by subcutaneous transfusion.

In spite of the shock and the loss of blood the patient bore the operation well. The pulse remained at over 130 for 24 hours, and

then gradually sank to normal. The urine during the first few days contained a considerable quantity of blood, thus indicating some injury to the vesical mucous membrane. This, however, cleared up by the third day and the bladder gave no further trouble.

The temperature was slightly elevated for some days, but never exceeded 101·4°, and the patient made an uneventful recovery.

The pelvic measurements were as follows:—

Interspinous	$9\frac{1}{2}$	inches
Intercristal	$9\frac{1}{2}$	,,
External conjugate	$6\frac{1}{4}$	,,
Diagonal conjugate	$4\frac{1}{4}$	,,
True conjugate	$3\frac{3}{4}$	,,

The child, a full term male, weighed $7\frac{1}{2}$ lbs.

The course of events in this case was probably as follows:—

The head failed to enter the pelvic cavity owing to some degree of flattening of the pelvis. After rupture of the membranes the uterine contractions induced marked stretching of the lower uterine segment. It is possible that the rupture occurred spontaneously, though the repeated application of forceps may also have played a part in its production.

The mortality of cases treated by abdominal hysterectomy has hitherto been high, and, according to the figures of Klein and Kolomenkin, referred to by Dr. Eden in his valuable paper, amounts to about 37·5 per cent.

In a recent contribution to the subject by Schütte more favourable results are recorded. He relates his experience of 19 cases of rupture of the uterus. In 6 of these the patient was in a hopeless condition from infection on admission to the hospital. In 13 cases which came under his care shortly after rupture had taken place—2 incomplete and 11 complete—operation was carried out with success in every case with one exception. In all the cases of complete rupture abdominal hysterectomy was performed, followed by vaginal drainage.

The causes of death after rupture of the uterus are hæmorrhage or infection, and these occur in about an equal proportion of cases (Klein). The shock, though often severe, is rarely directly fatal, and the gravity of the patient's condition is more frequently due to slight continued hæmorrhage, which may persist for several hours. The bleeding may take place into the abdominal cavity, or may extend as a retro-peritoneal hæmatoma, in some cases even reaching the connective tissue around the kidney. The existence of severe anæmia is by no means to be regarded as a contra-indication to the operation, as experience has shown that if the hæmorrhage is completely checked the most unpromising cases may recover. If the

case only comes under observation some hours after the accident there is a great risk that infection has already taken place and many cases untreated by operation die within a few days from acute peritonitis or septicæmia. This occurs with almost equal frequency in complete and incomplete rupture.

These facts appear to justify the conclusion that in all cases of severe rupture of the uterus abdominal section should be performed without loss of time, and that in the great majority of cases hysterectomy, with sub-peritoneal drainage, is the most efficient mode of treatment.

1. Eden. Rupture of the Uterus, "Journal of Obstetrics and Gynæcology of the British Empire," June, 1909.
2. Schütte. Behandlung des Uterusruptur," "Monatsschrift für Geburt. und Gynäk.," March and April, 1909.
3. Schütte. Behandlung des Uterusruptur," "Monatsschrift für Geburt. und Gynäk.," February, 1909.

CRITICAL REVIEW.

Recent Work on the Etiology of Eclampsia.

By Eardley Holland, M.D., F.R.C.S.

This paper contains an account of the work that has been done on the etiology of eclampsia during the past six years. Bearing in mind that a critical review has a wider object than the mere narration of literature, I have endeavoured to arrange in logical sequence the results of this work, in order that a comprehensive picture may be gained, and conclusions, as far as possible, be drawn.

A period of six years has been chosen with a definite reason. In a critical review entitled the "Causation of Eclampsia," which appeared in the January number of this Journal for 1904, Dr. Comyns Berkeley has given a complete account of our knowledge of the subject up to that date. The present paper, therefore, will form a direct continuation of his, and will deal with the progress that has been made from the date of his publication up to the present time.

Now, the past six years have been a particularly fertile period, and the year 1908 alone saw considerably over 100 scientific papers on the eclampsia problem. The real difficulty is to distinguish good work from bad, and to maintain a due sense of proportion. The reason of this concentrated output of work is not far to seek. A problem like eclampsia is attacked from every side and by every method; advances in general pathology, in biological chemistry, and in other branches of science, afford new means of attack. This desperate onslaught on the etiology of eclampsia may be directly traced to the great strides that have been made in our knowledge of (1) the general metabolism of the body; (2) the theories of immunity; and (3) the action of intra-cellular ferments, and the conception of autolysis.

The subject will here be discussed according to the following plan:—

I. The effects produced by eclampsia on the body:

A. The morbid anatomy of the various organs and tissues.

B. The chemistry of the tissues and secretions.

II. The significance of these effects, and their proper interpretation as regards the true nature of eclampsia.

III. The possible primary cause; mainly a discussion of the placental theory of eclampsia.

Part I. The Effects produced by Eclampsia.

It is only by a close inquiry into the effects, both anatomical and chemical, produced on the body by eclampsia, that a conception of the true nature of the disease can be formed. The clinical picture avails nothing here. In the first place, the symptoms are those common to many toxæmias, and are only peculiar to eclampsia because they occur in connection with pregnancy; and even here, who would undertake to diagnose acute uræmia, occurring in pregnancy, from eclampsia, except in the post mortem room? Secondly, the symptoms may be most variable, although the pathological picture remains fairly constant: the expression, "Eclampsia without convulsions," is sometimes used. Thirdly, eclampsia is now known to be only one manifestation of a profound disturbance of the body during pregnancy: eclampsia, toxæmic vomiting and acute yellow atrophy of the liver, present similar pathological pictures differing only in degree.

A. The Morbid Anatomy of the various Organs. Though the principal changes in the individual organs had been known for a long time, Schmorl was the first to insist that eclampsia was accompanied by a definite complex of changes, characteristic of no other disease.

In 1893 he published his exhaustive monograph, based on a personal examination of 73 fatal cases. In 1902, he published his latest paper, based on the post mortem examination of three women who died in the last months of pregnancy, after having exhibited all the symptoms of eclampsia, except convulsions: their organs were the seat of the whole series of changes, so characteristic in typical cases of eclampsia.

The conclusion of this authority may be taken as representing the most accurate knowledge of the morbid anatomy of eclampsia, based, as they are, both on his own extensive work, and on a consideration of the work of others. Briefly, they are as follow:—

Kidney. Renal changes are present in 99 per cent. of cases. It is important to note that these changes are not in the nature of an inflammation, but of a degeneration: the epithelium of the convoluted tubules is the part affected: the protoplasm of these cells is found in various grades of degeneration—cloudy swelling, fatty degeneration and coagulation necrosis. With Winter, who asserts that the glomeruli are the chief elements affected, Schmorl strongly disagrees. In the glomerular capillaries, fibrinous thrombi are found, but never proliferation of capsular epithelium and exudation of leucocytes.

In many cases the renal changes are slight: even in severe cases, the distribution of the changes is a patchy one: healthy and necrotic tubules may be found lying side by side. The severe clinical

symptoms cannot be dependent upon the renal changes. Schmorl has only met with one case in which the kidneys were quite healthy; in this case a most careful microscopical examination revealed nothing; but the other organs showed the usual changes.

Liver. This organ comes scarcely behind the kidney, in the frequency of changes found in it. These changes are most complicated: they are usually visible to the unaided eye, in contrast to the kidney. Sometimes, however, they are slight and are only revealed by the microscope. In his 73 cases, Schmorl found the liver affected in 71; even in the two negative cases thrombosis in main branches of the portal vein was present. The changes in the liver consist, briefly, in: necrosis of the cells, singly, in groups, or in large areas; in the latter the areas of necrosis may be anæmic or hæmorrhagic: fibrinous thrombi in the capillaries of inter- and intra-lobular veins, and fibrinous exudate between the liver-cells. Those writers who assert that liver-changes are not constant, have not used the microscope, says Schmorl.

The changes in the liver are the most significant and important of all; in the above little resumé they are given briefly, because a little further on some later work will be given in more detail.

Brain. In about 90 per cent. of cases, changes are found here, consisting of small hæmorrhages, and areas of necrosis associated with thrombosis of capillaries, both in the cortical and central regions.

Heart. Besides cloudy swelling and fatty degeneration of the muscle-fibres, areas of necrosis and interstitial hæmorrhages are found in about 60 per cent. of cases.

Less constant than the above are necrosis of cells and thrombosis of capillaries in the intestinal tract, pancreas, adrenals and muscles. A widespread thrombosis of capillaries is a constant feature of fatal cases of eclampsia.

To summarize, it may be said that the changes in the body produced by eclampsia form a constant pathological complex met with in no other disease. It matters not if, in any case, the changes in one organ are wanting, those in the other organs are ample to maintain the picture; irregular occurrences such as this are often met with in other severe intoxications, and are to be explained by the dose of the toxin, its concentration, and the time it has acted before death. Nor is it of consequence if the changes in each organ, considered individually, are met with in other diseases; for instance, in septicæmia, typhoid, scarlet fever and acute yellow atrophy apart from pregnancy, changes in the liver are met with very similar to those found in eclampsia. It is the simultaneous affection of different organs, rather than of one organ, that is characteristic. In spite of the absence of characteristic symptoms, eclampsia may therefore be diagnosed on the post mortem table.

Typhoid fever may be mentioned as a parallel example; atypical cases are frequent, but the changes in the small intestine, mesenteric glands and spleen are characteristic.

In 1907 Konstantinowitsch published a most important research on the liver-changes in eclampsia; his work may be considered the last word in the finer histological details, and is rendered all the more valuable by an attempt to correlate the anatomical changes with the nature of the eclamptic toxin and with its mode of action. His remarks are worth considering in some detail.

The material used was the livers of 30 patients whose clinical history was accurately known.

The liver changes fell into three main groups:—

I. Five cases. In these there were no fibrinous thrombi in the capillaries, nor necrosis of liver cells, nor hæmorrhages.

II. Twenty-three cases. There were marked changes in the periphery of the lobules consisting of hæmorrhages, fibrin formation, dilatation of capillaries, and degeneration of liver cells, varying from cloudy swelling to necrosis.

III. Two cases. In these the necrosis was diffuse and not limited to the liver-cells and endothelium of the capillaries, but also affected the connective-tissue of Glisson's capsule and its blood-vessels, throughout the liver.

The microscopical details of these groups are as follow:—

Group I. The earliest changes are seen at the periphery of the lobules: the contour of the cells is rounded, the nucleus stains poorly and is sometimes shrunken: the capillaries at the periphery of the lobule are moderately dilated, and the nuclei of their endothelium stains poorly.

These changes, in the absence of other conditions such as thrombosis of vessels or bacterial infection, denote a primary degeneration, due to some toxin. The moderate capillary dilatation may be ascribed to want of support from the contiguous degenerated cells.

Group II. The changes are still limited to the periphery of the lobules. The capillary dilatation is of two kinds—(1) a moderate and even one, similar to Group I; (2) wide local dilatations or ectasia, associated with thrombosis; interstitial hæmorrhages between the liver-cells accompany these; sometimes there are collections of blood between the liver-cells and the capillary wall. Since the endothelium of the capillaries is degenerated, these hæmorrhages may be ascribed to diapedesis of corpuscles through the dilated capillary wall, and sometimes to its rupture. The earliest seat of thrombosis is in the periportal capillaries: this, by causing obstruction to the blood flow, brings about the localized ectasia of capillaries in the neighbourhood of the periportal connective-tissue. The hæmorrhages may be ascribed to the same cause.

The direct cause of the capillary thrombosis is the action of the same toxin which caused degeneration in the liver-cells. These two changes are coexistent, and are produced by a common cause. Two other factors aid—the sluggishness of the hepatic circulation and the increased coagulability of the blood always present in eclampsia. Thrombosis in the interlobular veins follows, but is never seen without extensive changes in the periphery of the lobule. Necrosis of liver-cells is the other principal change found in this group. The process is a gradual one, commencing in the periphery of the lobule and extending. It is due to deprivation of blood-supply consequent on thrombosis of the periportal capillaries: when the interlobular vessels become thrombosed, the area of necrosis becomes extensive.

An interesting appearance was found in two cases with a prolonged clinical course. There had been a connective-tissue reaction and the formation of granulation-tissue in some parts of the liver. This shows that in long-standing cases, and therefore in cases which recover, an actual process of cirrhosis may occur.

Group III. The thrombosis is more extensive, and has involved the interlobular vessels. The areas of necrosis are correspondingly large, and may involve the periportal connective-tissue. In the necrotic parts the vessels are empty, and there is no deposit of fibrin around the cells—"anæmic necrosis." Large tracts of liver-substance may be in this state.

The proper sequence of these various changes may be summarized as follows:—The earliest change is a degeneration of the liver-cells and endothelium of the capillaries at the periphery of the lobule; this is a progressive change. Thrombosis in the peripheral capillaries soon follows, and, as a result, brings about dilatation of other parts of the capillaries and hæmorrhage into the neighbouring hepatic tissue. The next step of importance is necrosis of liver-cells in the areas of thrombosis and hæmorrhage. By stasis of the circulation and a gradual deposition of fibrin, thrombosis of the interlobular vessels soon follows; this causes necrosis of larger areas of liver-cells, and the formation of so-called anæmic infarcts.

Schmorl said that eclampsia can be diagnosed post mortem by taking into consideration the combination of changes in different organs. Konstantinowitsch goes further, and says that a diagnosis can be made from an examination of the liver *alone*. The changes here are peculiar not only in their nature, but in their distribution, which is different to that in any other liver condition. In the other intoxications, the changes are more confined to the central parts of the lobule. The invariable limitation of the early changes to the periphery of the lobules is peculiar to eclampsia.

He insists that there is no connection between the severity of

the liver affection, and the clinical severity of the case and the number of convulsions.

Suprarenal Glands. Chirié (1908) has made a special study of these in eclampsia.

No extended observations have yet been made on the effect of normal human pregnancy on the suprarenal gland.

Guièysse (1901) states that in pregnant guinea-pigs definite changes occur. These consist essentially in hypertrophy of the cortex, of which the zona fasciculata is the principal part affected, especially its outer zone (the zona spongiosa); the protoplasm of these cells becomes more reticulated, and the vacuoles become larger (spongiocytosis). The spongiocytosis extends deeply down into the cells of the zona fasciculata. In the zona reticulata there is excess of pigment and of granules in the cells. The medulla shows no change. All these changes denote hyperactivity of the gland, and Guieysse considers that in pregnancy this hyperplasia and hyperactivity is always necessary to neutralize toxic substances. Alquier has found the same changes in the glands of two pregnant dogs.

In 12 cases of eclampsia, four of pregnancy kidney, and one of retroplacental hæmorrhage with albuminuria, Chirié found well marked structural alterations, affecting both cortex and medulla. In the cortex there was great hyperplasia of all the zones, but chiefly of the zona glomerulosa and spongy layer of the zona fasciculata. The degree of spongiocytosis of these cells was markedly increased; nodular hyperplasia of spongy cells extended down into the deeper layers of the zona fasciculata. In seven cases there were striking changes in the medulla, consisting in (*a*) increase in the large medullary cells, and (*b*) increase in the small lymphocyte-like cells (parasympathetic cells of Wiesel).

In the cases of pregnancy kidney and retroplacental hæmorrhage the same appearances were found.

In three other cases of pregnancy, fatal respectively from bronchopneumonia, sepsis, and pyelonephritis, somewhat similar changes were found in the cortex, but were less pronounced. The medulla, on the other hand, showed no changes.

Chirié does not consider that suprarenal changes represent any causative factor in eclampsia, but are rather the result of renal and other changes, and denote an increase in antitoxic and vasomotor functions.

Thyroid Gland. Pottet and Kervilly (1907) examined the thyroid gland in four fatal cases. In three they found somewhat complex changes, the chief of which were the presence of many young embryonic vesicles, cystic dilatation of many vesicles, cirrhosis of the connective tissue and increased fluidity of the colloid substance, which often contained small granules. These changes are similar to those found in colloid goitre or cystic adenoma. There was never

any acute degeneration such as is found in the liver and kidneys. In one case the gland was of normal histological structure. Changes similar to the above were found in three fatal cases of puerperal sepsis. They conclude that changes in the thyroid gland are not always present in eclampsia, and that if they are, they are not typical.

Cell-emboli in Blood-vessels.

Liver-cells. The appearance of liver-cells in the blood-vessels of the liver was pointed out very early in the history of eclampsia, and they were looked upon as an important feature. They are now considered artefacts. In any case, they are not peculiar to eclampsia, and have been found in back-pressure livers.

Konstantinowitsch found them frequently, singly and in groups, in the branches of the portal and hepatic vein. They bear no proportion to the severity of the liver lesions. For cogent reasons he looks upon them as pure artefacts, favoured in eclampsia, by the friability of the liver-tissue.

Placental Cells and Villi. Schmorl was the first to point out that in eclampsia the presence of placental cells in the vessels of the lung is a constant feature. He affirmed that they were a feature peculiar to eclampsia, and were never found otherwise. The cells, consisting of both syncytium and Langhans' cells, but chiefly of syncytium, form small masses within the lumina of the vessels. Whole villi are seldom found. It is now known that such appearances are not peculiar to eclampsia, but are found in other cases of pregnancy—pathological and normal.

Schmorl, writing later (in 1905), states that he has found them in 150 cases of pregnancy: of these 83 were cases of eclampsia; so they are relatively common in women dying from other causes than eclampsia. Convulsions probably favour their occurrence. They are found in very early pregnancy before the onset of labour pains. In no case did he find them in such remarkable quantity as in two cases of abortion at the second month, dead from sepsis. Veit has taken up the subject very enthusiastically; in papers published in 1902 and 1904 he has speculated upon the possible results of placental emboli. They really gave him the initial idea, in formulating his "placental theory" of eclampsia.

Placenta. In eclampsia, the placenta is the seat of many changes. The majority are not peculiar to eclampsia, but are met with in the albuminuria of pregnancy, and, to a lesser degree, in normal placentas; such are, various forms of infarct, arteritis and œdema. They need not be further discussed here, for their presence in the normal placenta is well known through the work of Eden and others. At the same time, they are much more frequent and intense in cases of albuminuria and eclampsia, and may be looked upon as

the result of a chronic toxæmia; as to their connection with eclampsia, they are merely accompaniments, not consequences. The presence of these chronic degenerative changes in eclamptic placentas has been investigated by Brindeau and Nattan-Larrier, who give them no special significance. The changes in the placenta which may be said to be more peculiar to eclampsia are (1) hæmorrhages of varying degree, and (2) changes in the plasmodium of the villi.

(1) *Hæmorrhages.* Since in eclampsia, hæmorrhages are so frequent in other organs, it is not astonishing to find them in the placenta. They have been carefully studied by Brindeau and Nattan-Larrier, who describe three forms—(*a*) the hæmorrhagic nodule or placental apoplexy, formed by hæmorrhages of varying size and age, in the substances of the cotyledons; (*b*) diffuse hæmorrhage in the substance of the placenta; and (*c*) retroplacental hæmorrhage. Their mode of origin is shown on microscopical examination to be due primarily to dilatation of the vessels of the villi. There are two stages of this—(1) simple dilatation, which may be enormous, distending the villus so that only the narrowest strip of connective-tissue separates the blood from the chorionic epithelium; (2) rupture of the vessel, with hæmorrhage. If the hæmorrhage is slight a "hæmorrhagic nodule" is formed; if severe, a diffuse parenchymatous hæmorrhage results. This process of rupture is clearly seen in sections. Extensive connections are formed between the fœtal and maternal blood, and fœtal nucleated red corpuscles can be seen pouring into the maternal blood-spaces. Coagulation occurs in the neighbourhood of the rupture. These placental hæmorrhages occur, of course, in other conditions; but they are peculiarly constant in eclampsia.

(2) *Changes in the Plasmodium.* After Veit and Schmorl had propounded their placental theory of eclampsia, and had discovered placental cells in the maternal circulation, many workers attempted to show that there were changes in the placenta, which would lend support to the theory.

Fink found, in three eclamptic placentas, proliferation of the epithelium in the form of projecting buds of granular syncytium, some of which had become detached and were lying free in the maternal spaces.

U. Stroganowa, Bulius, Hermann and Seitz found the same. But soon others began to find that similar changes were found in normal placentas. A. Martin could find no differences in syncytial budding in normal, albuminuric and eclamptic placentas. G. Colorini (1905) has published an exhaustive research on this point, and came to the conclusion that an absolutely typical eclamptic placenta does not exist. The latest paper is by Brindeau and Nattan-Larrier (1908). They examined 21 eclamptic placentas, and were much impressed by special appearances in the syncytium. The chief is a nodular

hypertrophy, so that buds project from the surface of the villi. This hypertrophy is not even, but is associated with atrophy in other parts. Thus, four-fifths of the circumference of the villus is covered by atrophied cells, and the remaining one-fifth is made up of one or more projecting buds. The atrophic syncytium exhibits granular changes in the protoplasm and fragmentation of the nucleus; often the syncytium has entirely disappeared. The hypertrophied buds are provided with nuclei so abundant that the whole looks like a mass of chromatin, staining intensely with hæmatin; occasionally there are large vacuoles. Some buds lie free in the maternal spaces, and others have undergone coagulation necrosis. The authors consider that this budding is not peculiar to eclampsia, but is an exaggeration of the physiological condition. They conclude that there are certain placentas which may be said to be typical of eclampsia, because they present a *combination of changes* consisting in hæmorrhages, nodular and subchorionic infarcts, œdema, arteritis and plasmodial budding. Such a combination is uncommon. Two varieties of change can be distinguished—(1) chronic: infarcts, arteritis and œdema; these are due to a slowly-acting toxin, such as is present in albuminuria; (2) acute: larger hæmorrhages, dilatation and rupture of fœtal vessels, and proliferation of syncytium; these are due to an acutely-acting toxin, such as in eclampsia.

They, therefore, consider "that all the placental changes are due to the action of the poison (at present unknown) of the toxæmia of pregnancy, and that the changes in the syncytium have no connection with the cause of eclampsia, but are entirely secondary, and are a special form of degeneration, due to the direct contact of the syncytium with the toxic maternal blood."

The Blood—Red Corpuscles. Zangemeister and others have shown that, in by far the majority of cases, these are greatly in excess of the normal, the count in different cases varying from a little over normal to 9,360,000. Two peculiarities are—(1) the rapidity with which, in any case, the numbers vary from time to time; (2) great variations in numbers between different cases; thus, in the eclamptic cases examined by Zangemeister, the difference in the maximum and minimum counts was 5,120,000—in normal cases of pregnancy and labour, the difference was only 1,180,000. The same observer noticed that in two cases the convulsions ceased as soon as the number of corpuscles had fallen to normal, which might indicate, at first sight, a causal connection between the increased number of corpuscles and the disease; he points out that this cannot be so, because in some cases the numbers hardly ever exceeded the normal, and in others convulsions continued long after the numbers had fallen. Nor can the convulsions be the cause of increase in the number, for in some cases a high count was noticed long before the onset of convulsions. The evidence seems to be in favour of the

increase being a relative one, due to a rapid passage of plasma from the blood-vessels to the tissues (œdema).

White Corpuscles. In normal pregnancy there are great alterations in the number of leucocytes. Though this has long been known, recent work has made our knowledge more exact. Carton (1903) found that in the last month of pregnancy the numbers varied from 8,000 to 15,000; in labour, especially in primigravidæ, there is a further increase; in twin pregnancy the numbers are still higher. Pankow (1905) always found 10,000 to 12,000 leucocytes in primigravidæ in the last month of pregnancy, and, during labour, a further increase up to 20,000; immediately after delivery of the placenta he found a still further increase up to 25,000. In multiparæ the changes were not so constant; in 50 per cent. the number was normal during pregnancy, but during labour and immediately after delivery of the placenta, he always found a rise, even if a small one.

Arneth (1905) has counted the leucocytes differentially, according to whether they contain 1, 2, 3, 4 or 5 nuclei. Normally he finds:—

5 per cent.	... ...	1 nucleus	40 per cent., 1 and 2 nuclei.
35 per cent.	... ...	2 nuclei	
41 per cent.	... ...	3 ,,	60 per cent., 3 or more.
17 per cent.	... ...	4 ,,	
2 per cent.	... ...	5 ,,	

At the end of pregnancy and during labour the proportion is changed, and the corpuscles with 1 and 2 nuclei begin to preponderate, and after labour they have risen to 70 per cent. In multiparæ, even with a normal count, the same qualitative changes are present. Why the young corpuscles (those with the fewest nuclei) rise thus in numbers, is obscure.

This preliminary knowledge of the normal condition is necessary before passing on to the further changes which accompany eclampsia.

In eclampsia the number of white corpuscles is much greater than in normal pregnancy. Dienst found an average of 26,000 before labour, and 40,000 immediately after labour. In many cases there is a rapid diminution after labour is over. In cases of albuminuria of pregnancy he found the same high numbers. Qualitatively, according to Arneth's classification, he found that the leucocytes with three or more nuclei (the older ones) were in excess of those with a fewer number of nuclei. In the former varieties the protoplasm was often degenerated, and free nuclei were found in the blood. Dienst considers this increase in the white corpuscles as a factor of supreme importance in eclampsia, for he looks upon them as the origin of fibrinogen, the increase of which is the direct cause of the disease.

Zangemeister also finds a great increase in the number of leucocytes in eclampsia. But he does not consider them to have anything to do with the cause; for in some cases there was no increase even during convulsions, and in others, the numbers only began to increase after convulsions had already commenced.

B. The Chemistry of the Tissues and Secretions.

In spite of the large amount of work on the pathology of eclampsia (which really dates from the discovery of albumin in the urine by Lever in 1843) the chemical side has been, until comparatively recently, much neglected. Zweifel was one of the first to insist that the problem has now become a chemical one, and was the first investigator to conduct systematic chemical researches; he writes, "whoever says that eclampsia is a toxæmia should try to discover the poison." The reason for this neglect of the chemical side is partly that the changes in the urine and blood were taken for granted to be analogous to those occurring in nephritis and uræmia, and were investigated purely from that point of view, and partly that chemical researches required a high degree of technical knowledge and skill such as the average obstetrician did not possess.

Previous to Zweifel's work, the only important chemical researches on the poison of eclampsia were those of Gscheidlin and Spiegelberg (1870), who estimated the urea and ammonium carbonate in the blood; Voigt (1886), who looked for urea in the liver and muscles; Butte (1894), who estimated the urea in the blood; Poehl (1895), who found leucomaines in the blood; and Zangemeister (1901), who, at Zweifel's instigation, undertook a research on the amount of ammonia excreted in the urine in normal pregnancy and labour and in eclampsia.

The chemical facts, which have so far been discovered, may be conveniently given as follows—

THE URINE.

Alterations in the Partition of Urinary Nitrogen: the "Ammonia-coefficient."

Zweifel (1904) was the first to point out that in eclampsia, a high proportion of the total nitrogen took the form of Ammonia salts.

The proportions of the urinary nitrogen in health are, according to Folin, as follows:—

Total N_2 = 15·8 gms.		
	Urea	87·7%
	Ammonia	3·3%
	Creatinine	2·7%
	Uric Acid	0·7%
	Undetermined N_2	5·6%

Zweifel estimated the urine in 32 cases of eclampsia, and found the following alterations:—

(1) There is a great decrease in the urea-nitrogen; he found figures of 27, 48·2, 51, 53 and 55 per cent., etc., of the total.

(2) There is a great increase in the ammonia-nitrogen; it was always more than 5 per cent. of the total, and once reached 16·5 per cent.

(3) There is very little change in the amount of nitrogen excreted as uric acid.

(4) The remaining nitrogen was increased slightly during the attacks, and fell below normal during recovery.

In 1907, Ewing and Wolf published an extremely valuable account of their researches on urinary analyses in the toxæmias of pregnancy. Their methods may be taken to be more reliable than Zweifel's. They estimated the total nitrogen in the urine, and the amount present as urea, ammonia, uric acid and creatinine; by subtraction of the nitrogen represented by these substances from the total nitrogen, they were able to estimate the "undetermined nitrogen," *i.e.*, the nitrogen which is not represented by any of the above four substances, and which exists chiefly in the form of amino-acids.

A detailed account of their results would be superfluous here, for this has already been given in two recent articles by Longridge and Leathes, to which the reader is referred. As regards eclampsia their results may be seen in the following table.

	Total Nitrogen gms.	Urea Nitrogen; percentage of Total N.	NH_3 Nitrogen; percentage of Total N.	Undetermined N; percentage of Total N.	
Normal values (Folin)...	19	85–88	3–5	4–6	
Normal values in pregnancy... ...	—	—	—	—	
case 1	4–9·7	74–84	3·5–5·8	8–14·8	
case 2	—	71–84	2·8–5·8	7–14	
Eclampsia.					
case 22	8·7	70	5·3	19	Five convulsions : coma.
„ 23	18	67	7	22	Six convulsions : coma.
	11	78	8	11	Delivered.
„ 24	4·7	73	9	11	Five convulsions.
„ 25	—	42	18	—	Twenty-five convulsions : coma.
	9·9	79	8	8·5	Delivered.
„ 26	3	68	8·7	15	Delirium : jaundice : *no convulsions.*
	8·6	80	7·5	10	Day after delivery.
„ 27	—	36	6	—	Convulsions : coma.
next day.	—	43	14	—	Died : liver, early thrombosis.
„ 28	1·7	62	10	14·5	One fit : coma : death.
„ 29	4·5	65	14	13·6	Thirfy convulsions : liver, early thrombosis.

They therefore did not find such wide alterations in the ammonia-urea ratio as did Zweifel. Still the urea percentage was generally low and the ammonia percentage generally high, but variable. The most significant feature was the high proportion of undetermined nitrogen.

These authors and Williams have found the most marked alterations in the nitrogen-partition in toxæmic vomiting.

The Abnormal Presence of Organic Acids.

Zweifel at once saw the significance of the increased excretion of ammonia, and ascribed it to the presence of abnormal quantities of some acid in the blood. This acid he subsequently found to be lactic acid, which he found in the urine in 17 cases of eclampsia. He estimated it as zinc paralactate (by the zinc-carbonate method), which is recognizable as minute needle-shaped crystals. The amount he found was not large; an idea may be gained from the following examples:—

urine	in	26	hours	=360 ccm.	zinc paralactate	=0·169	gms.
,,	,,	32	,,	=721 ,,	,, ,,	=0·097	,,
,,	,,	18	,,	=637 ,,	,, ,,	=0·210	,,
,,	,,	14	,,	=410 ,,	,, ,,	=0·079	,,

In some instances the amount was too small to be estimated quantitatively. He found the estimation of lactic acid in the urine always difficult, because of the many other impurities, and found it in greater quantity in the blood, where it could be estimated with greater ease and certainty. He looked upon lactic acid as a disintegration product of protein—its presence therefore indicated imperfect protein metabolism.

Hofbauer (1907) examined the urine for amino-acids and other products of the disintegration of protein; he summarises his results, taken from 9 cases, as follows:—

Albumoses	Found twice.
Amino-acids	Glycocoll was found once.
Lactic acid	Found 3 times.
Formic acid	Found 3 times.
Succinic acid	Never found.
Pentoses	Never found

The search for these substances was based on the idea that there was a great disintegration of liver tissue during life. However, Hofbauer points out, that even if these substances were present in any quantity, their excretion as such in the urine is not likely, for they would be converted into ammonia or urea in the tissues.

The Chlorides.

In consequence of recent views on the connection between œdema and the retention of chlorides in the tissues, the relation of the excretion of chlorides to eclampsia is of interest. Zangemeister found a retention of chlorides in eclampsia. In normal pregnancy the excretion of chlorides is slightly decreased; the figures given by Zangemeister are:—

urine { pregnancy 10·66 gms. in 24 hours (average).
non-pregnant 15·95 gms. in 24 hours (average).

serum { pregnancy 0·65% of total salts.
non-pregnant 0·6% of total salts.

Cramer has treated cases of œdema without albuminuria in pregnancy with deprivation of salt in the food, and has had excellent results. But since he made no quantitative examination, the good results may have been entirely due to rest in bed, etc.

In eclampsia, at the beginning of an attack, Zangemeister found a noticeable decrease in the chlorides in the urine, at the same time the other urinary salts were excreted in normal amount, so that the retention cannot be due to renal insufficiency.

In the serum the amount of sodium chloride in the blood is 0·63 per cent. as compared with 0·65 per cent. in normal pregnancy, which shows that chlorides are not retained in the blood, but probably in the tissues. In any case the retention is not pathological or harmful.

The Liver.

A thorough chemical examination of the eclamptic liver has been made by Hofbauer with the object of showing the presence of products of protein disintegration: such substances would be produced by an autolysis of liver tissue during life. The material used was as fresh as possible, in no case did more than 24 hours elapse between the death of the patient and the commencement of the analysis. Without entering into a description of the complicated methods employed, it may be stated at once that the following substances were found:—

Fatty acids—formic, lactic and succinic acids.
Amino-acids—trypsin and glycocoll.
Albumoses, present in small amounts only.

Hofbauer gives no quantitative figures. He considers these results to be of considerable importance, for they demonstrate that during life, a considerable autolysis of liver-tissue occurs. An obvious objection may justly be raised against Hofbauer's work. It is well known that in the liver, post mortem autolysis rapidly occurs,

and this may be quite enough to account for the presence of the above substances. He has made no comparative examination with the livers of patients dead from other diseases than eclampsia.

Since many of the pathological processes occurring in eclampsia are intimately connected with this process of autolysis of cells, and since autolysis itself is a comparatively recent conception, a brief description of it will perhaps be not out of place; the more so, because, as will be shown in a later part of this review, autolytic changes play a considerable rôle in the placenta, in eclampsia. Without a clear conception of autolysis the most modern work on eclampsia cannot be followed.

Every cell has intra-cellular ferments or enzymes. These exercise an all-important function in the metabolism of the cell, which depends on them for the assimilation of foodstuffs brought by the lymph and blood. Normally they exist in a very firm combination with the protoplasm and have no action on the cell itself; their action is limited entirely to the fluids circulating around it. Some cells have more ferments and stronger ones, than others: of this, the liver and placenta are examples.

The ferments are of many varieties. The most important one is a proteolytic ferment, which can break down protein into its ultimate constituents. Since many of these products of protein disintegration have been isolated in the liver, placenta, blood and urine of eclamptic patients, the more important will be enumerated as far as they have been at present identified.

I. Simple ammo-acids of the fatty acids series.
   Glycocoll (amino-acetic acid).
   Alanin (amino-propionic acid).
   Amino-valerianic acid.
II. Di-basic amino-acids.
   Aspartic and Glutaminic acids.
III. The di-amino-acids, Lysin, Arginin, Histidin.
IV. The aromatic constituents, tyrosin, phenylalanin and tryptophan.
V. Prolin and oxyprolin, serin and cystin.

Other ferments are lipolytic, breaking down fats, and glycolytic, breaking down carbohydrates. In the normal state of affairs these cells all work in harmony for the good of the cell. It is quite otherwise when the integrity of the cell is impaired or when the activity of the ferments themselves is abnormally raised. They then turn upon the cell and attack it, breaking down the protoplasm. This process is known as autolysis. Pathologically, autolysis may occur during life: it may even occur physiologically, but in small degree, though in involution of the uterus it plays the chief part: it always occurs in the tissues after death.

This latter fact has enabled autolysis to be studied *in vitro*. The process is an easy one. Known quantities of an organ such as the liver are taken, under aseptic precautions, and placed in a series of test tubes, and incubated: the relative amounts of total nitrogen, protein-nitrogen, and soluble (non-coagulable, non-protein) nitrogen are obtained by an analysis of the fresh organ.

Analysis of the contents of the test tubes from time to time reveals the fact that the soluble nitrogen is gradually increasing at the expense of the protein, and the process can be followed both quantitatively and qualitatively.

The Blood.

Alkalinity of the Blood.

Zangemeister (1903) estimated the alkalinity of the blood by Zuntz's method, in normal pregnancy and in eclampsia.

In normal pregnancy he found:—

Maximum 0·248 gms. NaOH in 100 ccm. of blood.
Minimum 0·166.
Average 0·202.

In eclampsia the alkalinity is diminished, but there are wide variations between different cases. In many severe cases the alkalinity is normal or nearly so. His figures for 20 cases were:—

Maximum 0·218.
Minimum 0·048
Average 0·153

The variations are accounted for by differences in the amount of urine excreted in different cases. Diminished diuresis means retention of acids in the blood.

An isolated example was reported by Longridge (1905); he used Wright's method and found the alkalinity equal to

$\frac{N}{75} H_2 SO_4$ (Normal is $\frac{N}{35} H_2 SO_4$.)

Hæmoglobin in the Serum.

The relative frequency in eclampsia of hæmoglobin in the serum is striking. Zangemeister found in 5 times out of 14 cases; it was in the form of oxyhæmoglobin, never methæmoglobin. Estimated by the calorimeter and spectroscope it amounted to an average of 1·7 per cent. It was never found in normal pregnancy and labour.

Wychgel, on the contrary, found hæmoglobin in the serum in 8 out of 23 cases of normal pregnancy; but his technique does not appear to have been perfect.

Zangemeister has tested eclamptic blood for hæmolytic properties,

but without success. He concludes, therefore, that hæmoglobinæmia in eclampsia is not due to the presence of a hæmolytic toxin, but to the absorption of hæmoglobin from blood extravasations in the liver, which were present in abundance in the case which showed the highest degree of hæmoglobinæmia.

Molecular Concentration of the Blood.

This is estimated by determining the freezing point. A lower freezing point than normal indicates retention in the blood of substances of a low molecular value and a disturbance in the eliminating function of the kidney.

In normal blood, the freezing point is −0·56°C.

For eclamptic blood Schroeder found the freezing point −0·605°C. and −0·655°C. in two cases.

All other observers have found different figures.

Futh found −0·501°C. and −0·54°C.; Szili found no appreciable difference between normal and eclamptic blood; Dienst found the same; Zangemeister found −0·551°C., −0·553°C., −0·554°C. and −0·536°C. in different cases. The conclusion is, therefore, that the molecular concentration of eclamptic blood is, if anything, less than normal blood. This shows that there is no retention of urinary constituents and no disturbance of total renal function as in uræmia, in which the freezing point is as low as −0·6°C.

Lactic Acid in the Blood. Zweifel examined the blood, withdrawn from a vein in the arm, in eight cases of eclampsia and found lactic acid present in all. As examples, the amount in four of these cases (estimated as zinc paralactate) was 0·0121, 0·0093, 0·0155 and 0·0892 gms. per cent. He also found it regularly in the blood of children of eclamptic mothers. In these, both placental blood, and the blood from the umbilical cord was used for the estimations. The amounts he found in the blood and urine in mothers and children respectively may be seen from the following examples:—

Urine ... ... a trace.	Urine ... ... 0·1%
Blood from vein ... 0·009%	Blood from vein ... 0·1138%
Blood of child ... 0·025%	Blood of child ... 0·081%
	Placenta blood ... 0·2016%
Urine ... ... 0·043 grms.	Urine ... ... 0·0513%
Blood from vein ... 0·0121%	Blood from vein ... 0·0773%
Blood from cord ... 0	Blood from cord ... 0
Blood from placenta 0·0508%	Blood from placenta, a trace.

Lactic acid, then, shows wide variations, and its presence seems transient from time to time. It is probably rapidly destroyed in the

body, a fact which is well known from animal experiments. In three cases Zweifel found more lactic acid in the fœtal blood from the umbilical cord, and in three cases, more in the placental blood than in the maternal blood. He thinks it reasonable to suppose that, in these cases at all events, the acid is produced in the fœtus and passes to the mother and is not produced in the mother as the result of the fits. This, considering the great variations found in different cases, and the admitted transient presence of the acid, seems a highly hypothetical suggestion.

In two cases of pregnancy kidney, with no eclamptic convulsions, he found lactic acid in the blood in amounts of 0·0076 per cent. and 0·0252 per cent.

In a fatal case of uræmia occurring in the puerperium, with 205 fits, no lactic acid was present at any time in the blood or urine.

Zweifel admits the possibility of the convulsions being the direct cause of the presence of lactic acid in eclampsia, but he is convinced that this is not the case, for the following reasons:—

(1) Lactic acid is present in some cases before convulsions occur.

(2) It is sometimes found in greater quantity in the fœtal than in the maternal blood.

(3) It is found in cases of pregnancy kidney without convulsions, and it was not present in the above case of uræmia. In his most recent paper (1909) he again returns to the subject of the significance of lactic acid in the urine in eclampsia, and gives results of his investigations of the urine in epilepsy. In only one case of this, out of many examined, did he find lactic acid, and in that case it ceased to be present after meat was withheld from the diet.

The whole question will be discussed in the second part of this review.

The Protein Constituents of the Blood.

Lewinski (1903) gives the following figures:—

Healthy normal.	Total albumin = 6·66—8·11%	serum globulin 1·02 serum albumin 1·97
Healthy pregnant.	Total albumin = 6·9—8·2%	serum globulin 1·48 serum albumin 1·54
Healthy normal.	Fibrinogen = 0·31%	
Healthy pregnant.	Fibrinogen = 0·45%	

In eclampsia, Dienst (1908) finds, from an examination in four cases, that the total albumin is slightly decreased, the average being 6·71 per cent. The fibrinogen is much increased, the average being

0·53 per cent. In the fœtus the fibrinogen content, though raised, is less than in the maternal blood. He considers the increase in the fibrinogen in eclampsia most important, and accountable for nearly all the thrombotic and other changes which occur in the body. He ascribes its formation to the breaking down of white blood-corpuscles, which are always in excess in eclampsia, for he found a direct proportion between the increase in leucocytes and the increase in fibrinogen:—

Healthy Pregnant.	Leucocytes = 11,450.	Fibrinogen = 0·063.
	14,400.	,, = 0·071.
	16,300.	,, = 0·082.
Pregnancy Kidney.	Leucocytes = 25,000.	,, = 0·086.

(To be continued.)

Obituary Notices.

In earnest sympathy with our continental colleagues we have to deplore recent losses to our branch of the medical profession—from the deaths of several distinguished men.

On July 3, 1909, Hermann Johannes Pfannenstiel succumbed to a poisoned wound contracted in the removal of a suppurated ovarian tumour. He was little more than 45 years old. Qualified in 1885, he became, after earlier appointments, Assistant to Fritsch at Breslau in 1887; Privatdozent in 1890; Chief Physician to the Elisabetherinnen Krankenhaus at Breslau in 1896; was given the title of Professor the same year, and in 1902 was called to succeed Loehlein at Giessen. In 1907, after having declined Freiburg, he accepted the Chair at Kiel. An ardent investigator, a successful and humane physician, he had a remarkable aptitude for teaching. He had been Senior Secretary of the German Gynæcological Society since 1891, Co-editor of the *Archiv für Gynäkologie* since 1896. His inaugural dissertation was on the "Extirpatio uteri carcinomatosi," his Habilitationschrift as Privatdozent on "Pseudomucine der cystischen Ovarialtumoren." His worldwide reputation, however, was rather due to his works on the Pathology of the Ovaries in Frommel's Jahresbericht (1894) and on Die Krankheiten des Eierstocks und des Nebeneierstocks in Veit's Handbuch (1897) and to the improvement in laparotomy by his transverse incision. He attended many congresses, and his contributions were always original and valuable.

Max Runge died from intestinal paresis within a week of the apparently successful removal of an hypernephroma, when barely 50 years of age. After being assistant to Gusserow, and qualifying as Privatdozent in 1879, he was appointed Professor at Dorpat in 1884, and transferred to Göttingen in 1888. In 1885 he published a monograph, of which a second edition appeared in 1893, on "Die Krankheiten der ersten Lebenstage." A ninth edition of his "Lehrbuch der Geburtshilfe" appeared this year; a third edition of his "Lehrbuch der Gynäkologie" in 1907; the fifth edition of his work on "Das Weib in seiner geschlechtlichen Eigenart" appeared in 1904. He was an organizer of remarkable ability, and almost unsurpassed as a teacher. He was entrusted by the Prussian Government with the preparation of an Official Manual for Midwives, of which the second edition appeared in 1904. In 1886 he reported (for Gusserow) to the Congress at Munich upon Puerperal Fever, and quite recently at Strassburg was able to defend his views upon its treatment.

Friedrich Engelmann, who in 1868, at the age of 26, succeeded to his father's extensive practice at Kreuznach, studied in Heidelberg and under Langenbeck in Berlin, but also in England under Lawson Tait and Lister. He had a very extensive experience of gynæcological complaints—was indeed able to report upon 1400 cases of uterine myoma, and on their treatment by electricity and radium.

Hofrat Professor Alfons Edler von Rosthorn, Director of the II. Obstetric Klinik of the University of Vienna, the Co-editor with Auguste Martin of the *Monatsschrift für Geburtshilfe und Gynäkologie*, died in his fifty-second year, from heart disease, on the 7th August. An Austrian by birth, he commenced studying Zoology at Vienna, in 1876; from 1880 to 1883 he was Prosector of Anatomy under Langer and Toldt, and after a year of study of operative surgery under Billroth, became first assistant at Wölfler's Surgical Klinik at Graz. In 1888 he turned to gynæcology, becoming assistant to Breisky at Vienna, and remaining on with his successor Chrobak. He qualified as Privatdozent in 1890, and the following year went to Prague, where he became Director of the New German University Klinik in 1892 and Professor in 1894. While at Graz he had declined calls to Groeningen and Utrecht, and in rapid succession he had been on the selected lists for Basle, Koenigsburg, Strassburg and Berlin. In 1902 he accepted the Chair at Heidelberg, but in 1908 was called to Vienna to be Director of the largest and best Gynæcological and Obstetric Klinik in the world. Owing to unforeseen delay his active duties had only extended over two semesters, but his lecture room was crowded with qualified and unqualified students. The deep regret at his untimely removal, felt generally throughout Germany and Austria, is displayed in the obituary notices in the *Monatsschrift*, the *Zentralblatt*, the *Müenchener m. Wochenschrift* and other Journals. His early studies in Zoology and Anatomy gave an exceptional breadth to his views, teaching and writings, and there was hardly any field or borderland in Obstetrics or Gynæcology which he did not adorn. In particular his work on the Diseases of the Pelvic Connective Tissue (1897), his work (in conjunction with Chrobak) on the Diseases of Women, his masterly reports upon Tuberculosis of the Female Genital Organs, that upon the anatomical changes in those organs caused by pregnancy, and that, to the Congress of Internal Medicine at Vienna in 1908, upon the relation of Gynæcological to General Disease. His various appointments show the liberality of the Universities upon the Continent in the selection of their Professors, but von Rosthorn seems to have been a man distinguished not only by comprehensive knowledge, wide experience, and remarkable aptitude for teaching, but also by personal charm, and a sympathy that encouraged all his pupils and assistants. He devoted little time to private practice; teaching and research were always first with him. J. J. M.

REVIEWS OF CURRENT LITERATURE.

X-rays in Gynæcology.

E. B. HAZELTON (*Brit. Med. Journ.*, 1909, vol. ii, p. 461) describes the method of Albers-Schönberg of irradiating the uterus through the abdominal parieties. The patient is laid horizontally on a couch, a compression cylinder of a diameter usually of 13 cm. is used, and the endeavour should be to irradiate the tumour and the uterus only, and avoid irradiation of the intestines. Between the skin and the compression cylinder is placed a screen composed of six layers of tinfoil interposed between four layers of thin kid leather each 1 mm. thick. The focus tube should be kept at a hardness of 6 to 8 on a Walter's scale, and a current of 4 to 5 milliàmperes passed through it. At a distance of 38 cm. tint B of Sabouraud and Noiré or 5H is obtained in four sittings of six minutes each, such a series being given twice a month. Excellent results have been obtained in cases of myoma, molimina menstrualia, leucorrhœa, metrorrhagia, and menorrhagia of the climacteric. Atrophy of the ovaries with cessation of menstruation not infrequently results, hence this method may be used as a substitute for oöphorectomy in the production of sterility in cases of contracted pelvis, osteomalacia, and so on. FRANK E. TAYLOR.

Tumours of the Large Intestine Simulating Disease of the Uterus or Uterine Appendages.

V. BONNEY (*Lancet*, 1909, vol. ii, p. 525) records five cases which illustrate how closely tumours of the large intestine in women may simulate diseases of the uterus or its appendages. They were, respectively, (1) inflammatory tumour of the cæcum simulating a uterine myoma, (2) carcinoma of the transverse colon with a secondary growth in the sigmoid simulating a malignant ovarian tumour, (3) carcinoma of the sigmoid colon simulating an ovarian dermoid cyst, (4) carcinoma of the sigmoid simulating disease of the right uterine appendages, and (5) carcinoma of the sigmoid with secondary growth in the anterior rectal wall simulating a malignant ovarian tumour. In all five cases the intestinal tumours were successfully excised.

FRANK E. TAYLOR.

A Case of Kraurosis.

JACOB FRANK (*Surgery, Gynæcology and Obstetrics*, August, 1909) reports: a woman, aged 28, married 5 months, sought relief for itching and pain in the vulva and inability to endure intercourse. The trouble began, five or six years previously, with attacks of needle-like pains and itching of the vulva. At first these only occurred when her general health was impaired. Later both pain and itching had been worse and more frequent, especially since her marriage. Menstruation was normal and there was no vaginal discharge. The patient was examined under anæsthesia. The pubic hair was scanty and dry. The skin of the labia minora and for two-thirds of an inch on the labia majora was dry, white, shrunken and like leather. The line of demarcation was abrupt. The vaginal orifice was so small, due to cicatricial-like tissue, that it was difficult to insert the little finger without lacerating the parts. The hymen was intact. The vagina was normal. The labia majora, labia minora, glans clitoridis and hymen were dissected away, a triangular area of healthy mucous membrane around the meatus being left. Commencing at the upper border the skin was united from side to side until the angle of the urethral triangle was reached, when the upper

portion of the mucous membrane of the triangle was sutured to the skin and the lower portion was sutured to the vagina. The rest of the vaginal mucous membrane was sutured to the skin around the whole circumference. Later a large bivalve speculum could be easily inserted into the vagina without causing pain, and the patient has had no return of the symptoms. Frank points out that though the disease is most common about the menopause, cases at ages varying from 16 to 72 have been reported. The ætiology is quite uncertain; Frank thinks it is probably a trophic nerve change. MILES H. PHILLIPS.

Tuberculous Elephantiasis of the Vulva.

E. FORGUE and G. MASSABAU (*Rev. de Chirurgie*, 1909, No. 6, p. 1029) consider tuberculosis to be an exceptional cause of elephantiasis and record the following case of tuberculous elephantiasis of the vulva: A woman, aged 35, suffered from tuberculous axillary glands when 15 years of age; these were treated by incision and curettage. At 20 she presented tuberculous cervical glands treated by excision. Two years ago she had chronic persistent diarrhœa and then developed a swelling of the right labium majus which has gradually increased in size. Eight months ago some induration appeared in the right inguinal region, later in the left, and the lower limbs became œdematous. Eight days before admission into hospital a fistula appeared in the inguinal swelling and discharged pus abundantly. There had been amenorrhœa and leucorrhœa for seventeen months. Consolidation and râles were found in the left apex. The right labium majus was enlarged to the size of the scrotum, and its cutaneous surface presented small nodosities varying in size from a millet seed to a pea. Towards the lower pole, this papillomatous condition of the skin formed a lobulated tumour the size of a nut covered with macerated epidermis. Both inguinal regions contained enlarged glands forming adherent indurated masses with fistulous openings discharging a sero-gummous liquid in which tubercle bacilli were found. On January 14th, 1908, the two labia majora were resected and the glandular masses with the adherent and thrombosed saphena and femoral veins were excised. The patient died of phthisis on December 20th. FRANK E. TAYLOR.

A case of Accessory Ureter opening on the Vulva: Cure by Removal of the Kidney.

C. D. JOSEPHSON (*Zeitschr. f. Gynäkol.*, vol. xxxiii, p. 24, 1909) reports: The patient came under observation when 10 years of age, suffering from incontinence of urine. The urine dribbled through a small opening below and to the left of the urethral orifice. Injection of methylene blue into the bladder caused no colouration of the urine from this opening, whereas colouration was produced by subcutaneous injection. The opening was therefore diagnosed as the orifice of an accessory ureter. When 18 years old, the patient again presented herself for further treatment. Cystoscopic examination showed that two normal ureters opened as usual into the bladder. The abdomen was opened and methylene blue injected into the pelves of the two normal kidneys. No colouration of the urine from the accessory ureter was produced, which showed that the accessory ureter belonged to an accessory kidney. The left kidney was freed, and the accessory kidney was found close beside it. This was removed, and the patient made an excellent recovery.

Vesico-ovarian Fistula diagnosed by Cystoscopy.

R. CASSANELLO (*Zeitschr. f. Gynäkol. Urol.*, Nr. 4, 1909) reports an interesting case, with clinical signs of right-sided pyelitis or pyonephrosis. The cystoscope showed that the pus did not come from the right kidney, for clear urine flowed from the right ureter. A few granulations projected beside the orifice of the left

ureter; and pressure on the lower part of the abdomen caused pus to flow through a kind of furrow surrounding these granulations. Since a few years previously, consequent to puerperal infection, the right adnexa had been the seat of an inflammatory mass, intimately connected with the bladder, a diagnosis of vesico-tubal or vesico-ovarian fistula was made. Laparotomy proved this to be correct. The uterus and right adnexa were removed and the opening in the bladder was sewn up. A catheter was left in the bladder and abdominal and vaginal drainage employed. The patient made a successful recovery.

Hydatid Cyst of the Uterus; Hysterectomy; Death.

S. Clark (*Lancet*, vol. ii, p. 1684). An Afghan woman, aged 30 to 35 years, had noticed a swelling in the suprapubic region for 13 years. For four years this had gradually increased in size till it was the size of a nine months pregnancy. The growth had never been painful, and there had been no pregnancy. Menstruation was always normal except for a years' amenorrhœa two years ago, and the general health was impaired.

Abdominal section was performed. The uterus presented. The cavity of the uterus was opened and a large trocar was thrust into the tumour, from which daughter cysts were seen to escape. The large intestine was adherent to the tumour. The uterus and greater part of the tumour were removed. The remaining part of the tumour, of the size of a cocoanut, could not be dissected off the bowel, so the lining membrane was destroyed with carbolic acid and scraped, and the edges were brought together with a purse string suture. A quart of saline solution was left in the abdomen. The patient died 49 hours later. Frank E. Taylor.

The Surgical Treatment of a Frequent Cause of Dysmenorrhœa and Sterility.

S. Pozzi (*Surgery, Gynæcology and Obstetrics*, August, 1909) describes his operation of "Stomatoplasty with commissural evidement" for conical cervix with a punctiform external os. This condition generally coexists with a long cervix and a cervico-corporeal anteflexion of the uterus, and is, Pozzi finds, the most common cause of dysmenorrhœa and sterility. Dysmenorrhœa is sometimes absent but sterility almost always obtains. Cervical mucus, retained on account of inefficient drainage, forms an important obstacle to fecundation. Slight infection usually by a simple saprophyte, of this pent up mucus, leads to a cervical metritis, of which the predominant symptoms are leucorrhœa and dysmenorrhœa. In such cases a considerable and unsuspected quantity of accumulated discharge can often be squeezed out of the cervix. In long standing cases, mucous polypi, single or multiple, occur. Simple dilatation has but an ephemeral effect. Bilateral section also gives no permanent result, and Pozzi has seen many cases so treated in which infection of the wound and of the parametrium and adnexa by the lymphatics has occurred. His operation is performed thus: a bullet forceps is placed on each lip of the cervix, which is then split bilaterally for 2 or 3 centimetres. The canal is dilated, with Hegar's dilators, up to No. 20. (The uterus is always curetted and a solution of perchloride of iron injected into its cavity.) Each half of the divided cervix presents three areas, a median mucous groove, and the two lateral bleeding surfaces. A deep strip of tissue is now removed from each of these lateral surfaces. Then the internal mucosa of the cervical canal is united to the external vaginal mucosa of the portio, in the case of each of the four lateral surfaces. Pozzi uses silver-wire sutures, one being first passed from the vaginal to the cervical mucosa, on each side at the angle of section. Two sutures usually suffice to close each of the four small wounds. They are removed on the 12th to 15th day. The results are most satisfactory; dysmenorrhœa is immediately and definitely cured, the cervical metritis rapidly disappears and pregnancy has

followed in more than 25 per cent. of the cases of sterility; in some cases after 5, 10 and, in one instance, 16 years of married life. The technique is depicted in five excellent illustrations. MILES H. PHILLIPS.

A Series of Five Hundred Laparotomies.

DOBBERT, St. Petersburg (*Volkmann's Samml.*, No. 517), discusses the results of nearly ten years' experience in the Alexandra Institution in relation to the special precautions taken to protect wounds from sepsis (verstärkter Wundschutz). He gives details of the methods used by himself and his colleagues and describes the materials used; the whole paper is meant to compare these results with those of surgeons who use the special rubber coverings for the wound, gloves and so on. The picture of Russian methods is interesting but calls for no special remark on the general ground covered. E. H. L. O.

Torsion of Subserous and Interstitial Uterine Fibromata.

PIQUAND and LEMELAND (*Revue de Gynécologie*, May—June, 1909) give an account of this condition in general, of which the article abstracted above is a particular application. In addition to the causes mentioned above, the large size of the tumour in the non-pregnant cases has been remarkable, as also the presence of another tumour: further, in view of the proportional occurrence of twisting, it is possible to look on pregnancy and the puerperium as conditions favouring its production. The sigmoid flexure of the bowel is more likely to cause torsion by pressure while the tumour is low down; in pregnancy it is more often some part of the small intestine. Even in the non-pregnant state operation is indicated as soon as the diagnosis can be established. Sixty-one cases of operation have been collected with a mortality of 8 per cent. The article, which runs to nearly 90 pages, is illustrated with 15 plates of the macro- and microscopic appearances, and 8 cases are described in detail.

E. H. L. O.

Torsion of Uterine Fibromata during Pregnancy.

PIQUAND and LEMELAND (*L'Obstétrique*, July 1909) complete an article in the *Revue de Gyn.*, May–June 1909, in which they dealt with the torsion of uterine fibromata in general. They divide the cases into two classes, those in which the proper pedicle of the myoma is twisted and those in which the uterus is itself twisted. These occur with almost equal frequency, and the authors have collected 13 observations of the first class and 12 of the other, as they refer to cases only when the condition has been verified by operation or by autopsy. It occurs chiefly in the earlier months of pregnancy in elderly primiparæ. The causes of the twisting of the pedicle proper are much the same as in the non-pregnant state, namely a lateral insertion of the pedicle on the uterus and its eccentric insertion on the tumour, the large size and ovoid or reniform shape of the tumour; curiously enough the pedicles described have often been short and thick. The exciting cause is commonly the forward pressure of a neighbouring organ, *i.e.*, usually the bowel. Similarly with torsion of the uterus the tumour is usually unsymmetrical. The results of the torsion shew nothing special beyond the results of congestion in the tumour and inflammatory products externally, adhesions and so on, though in rare cases necrosis and suppuration may supervene. There are no pathognomonic symptoms, and, in the absence of a previous knowledge of the existence of the tumour, a diagnosis may be impossible. The tumour sometimes shows increase in size with diminished mobility and with increased softening, but these features are commonly masked by the tenderness and by meteorism. The symptoms are often those of acute intestinal obstruction. The differential diagnosis from acute appendicitis or from ovarian tumour may be impossible to a stranger. The prognosis is bad where the symptoms are severe; of 25

cases in all, 2 died after operation out of 22, and of three cases without operation all died. Obviously the treatment is to operate early: enucleation should be performed where this is possible, otherwise hysterectomy is necessary. Cases are recorded where the pregnancy was not interrupted. E. H. L. O.

Lymphangio-endothelioma of the Ovary.

T. Kubo (*Arch. f. Gynäkol.*, vol. lxxxvii, Ht. 3, 1909) reviews, in the first part of this paper, 52 cases of endotheliomatous new-growths published by other writers, and recognizes, with Borst, three types (1) Hæmangioendothelioma, and of these (*a*) intravascular, whose origin is from the endothelium of capillaries, and (*b*) perivascular, the so-called peritheliomata, originating from the cells of the tunica adventitia. (2) Lymphangioendotheliomata, originating from the endothelium of lymphatic vessels. Of the 52 cases, there were 32 lymphangioendotheliomata, 4 endotheliomata, and 14 peritheliomata: 2 cases were of metastatic origin.

In the second part of the paper, Kubo describes a case observed by himself, of an ovarian tumour removed from a patient 41 years of age. The tumour was so necrotic and hæmorrhagic, that, in a few places only, could portions of living tissue be distinguished. Three years after the first operation an intestinal metastasis, as large as an apple, together with the other ovary, which had undergone cystic degeneration, was removed. Ten years later, the patient is still alive and free from further metastasis.

The original ovarian tumour was a typical lymphangioendothelioma, and certainly of primary, and not metastatic, origin. The typical histological arrangement of the endothelial cells in his case was: (1) The striking appearance of the tumour cells in cell-chains arranged either like strings of pearls, or in double columns, or in hollow tubes of cells running parallel with the connective tissue bundles. (2) The intimate connection of these characteristic forms, with other parts having a carcinomatous or sarcomatous arrangement. (3) The obvious connection of the tumour cells with the stroma.

Kubo concludes that there is a special endotheliomatous variety of new-growth of the ovary, quite distinct from carcinoma or sarcoma. It has a peculiar histological structure, which proclaims the origin of its cells.

There are no special points in the clinical diagnosis of this variety of new-growth from other malignant ovarian tumours. Although it forms metastases, it is less malignant than primary sarcoma or carcinoma of the ovary.

Graafian Follicle Cyst and Myoma of the Ovarian Ligament.

Howard Kelly and T. L. Cullen (*Myomata of the Uterus*, 1909) report "Changes in the Utero-Ovarian Ligament," as detected in their long series of operations for uterine fibroids. In two instances, a cyst was found connected with the ovarian ligament. A large, irregular myomatous uterus was removed from a married woman aged 44. A thin-walled cyst, one inch and three-quarters by one inch and a fifth in diameter, occupied the right ovarian ligament midway between its uterine and ovarian attachments. The authors supply the reader with a fine drawing of this cyst; it seems to bear two smaller cysts on its surface close to its uterine end. Unfortunately the specimen was lost before it could be examined under the microscope. In the second case the patient was a coloured woman, married, and thirty-eight years of age. Hysterectomy was performed for a large myoma. The right Fallopian tube was normal, "the ovary was much drawn out," and bore two dilated follicles. The right ovarian ligament was elongated, and contained three distinct, small, thin-walled cysts; the largest measured over three-quarters of an inch in long diameter. The authors, as in the first case, publish an illustration of the specimen. On microscopical examina-

tion these cysts were found to be essentially ovarian elements, typical Graafian follicles. The authors add, "this is the only instance in which we have ever found the ovarian elements in the utero-ovarian ligament." They turn attention to this drawing which demonstrates that the ovary was displaced unusually far out, making the ligament abnormally long. They further are of opinion that had the ovary been in its normal position, these apparently aberrant ovarian structures would in all probability have been included in the ovary. Kelly and Cullen have come across five cases of myoma of the ovarian ligament and all were associated with uterine myomata. All proved to be identical in histological elements with the uterine new-growth. None had attained large proportions, the biggest measuring only one inch and three-quarters in long diameter. Most were sessile, but one was very distinctly pedunculated (*loc. cit.*, fig. 250).

[The Reporter turned attention to both the subjects mentioned in the above abstract in the Harveian Lectures on Fibroids of the Uterus and its Ligaments (Lect. I, *Lancet*, Vol. i, 1903, p. 350). He demonstrated the anatomy of the ovarian ligament, and noted that short as it is, it may contain ovarian tissue; in other words, follicles as well as stroma. This fact is of high importance, not so much in respect to fibroids as to the explanation of pregnancy after removal of both ovaries for cystic tumour (*Trans. Obstet. Soc.*, Vol. xliv, 1903, p. 231). It is remarkable that Kelly and Cullen chanced to come across so few genuine cases of myoma of the ovarian ligament. All were small, like the specimen described by the Reporter in the *Trans. Pathol. Soc.*, Vol. xxxviii, p. 245. The well-pedunculated myoma figured by Kelly and Cullen suggests that some of the large "fibromata" of the ovarian ligament described by Briggs (*Brit. Med. Journ.*, Vol. i, 1897, p. 1083) and by the Reporter (*Ib.*, Vol. i, 1889, p. 1287) were of the same type, containing myomatous elements often overlooked.] ALBAN DORAN.

Primary Cancer of the Fallopian Tube.

LECÈNE (*Annales de Gynéc. et d'Obstét.*, July, 1909) considers that the rarity of new-growths of the Fallopian tube is possibly more apparent than real, and he publishes a seemingly authentic case where, in his opinion, there was no evidence of a pre-existing innocent papilloma. The patient, who was under the care of Professor Hartmann, was 48 years of age. She had been married twenty-eight years, had borne three children to term and had miscarried once, seventeen years before she came under observation. It appears that the patient suffered from metritis and peritonitis after the miscarriage. She consulted Hartmann on account of uterine hæmorrhages, which had existed for two years, and had recently become so frequent as to obscure the date of the catamenia, which had previously been regular. A firm tumour reached from the hypogastrium to the umbilicus, and a well-marked tuberous lobe lay on its right side, extending to the right iliac fossa. There was a mass in Douglas's pouch, pushing the cervix towards the symphysis. The tumour, the pelvic mass and the cervix all moved together to a limited extent, and were tender to touch. "Fibroid uterus with inflamed appendages" was the diagnosis, and multiple pelvic adhesions probable. Hartmann, at the end of August, 1908, removed the entire uterus with the cervix and appendages. The vermiform appendix had undergone axial rotation and was amputated. The uterus contained, as was suspected, several interstitial myomata, the mass in Douglas's pouch consisted of a left hydrosalpinx and an enlarged ovary, adherent to the back of the uterus. The right Fallopian tube was much enlarged, tuberous and dilated, the right ovary was slightly cystic and covered with adhesions. The tube was filled with broken-down pale pink "encephaloid" bodies. A secondary deposit, as big as a cob-nut, was found in the muscular tissue of the uterine wall, another distinct deposit was detected in the middle of the left ovary, whilst its fellow, which was on the same side as the cancerous tube, was free from metastases.

Lecène found that the soft new growth in the right Fallopian tube was an infiltrating atypical epithelioma, poor in connective tissue stroma but very rich in epithelial cells. A few pseudo-glandular involutions were detected, but, for the most part, the epithelial cells were arranged in columns infiltrating the muscular tissue under the mucous membrane. Lecène admits that the miscarriage many years before the operation had caused pelvic inflammation which, becoming chronic, had damaged the tubal mucosa, thereby predisposing it to cancer. He denies that cancer of the tube is always the result of malignant degeneration of a benign papilloma. [Those who maintain the theory which he denies, mean by "papilloma" the "hyperplastic salpingitis" of Le Count, which is the same as the "endosalpingitic papilloma" of Macrez. In other words, they, like Lecène himself, trace the cancer to tissues altered by chronic inflammation.—*Rep.*] The patient was in good health, free from any sign of recurrence, at the end of last June, ten months after the removal of the growth.

ALBAN DORAN.

Intra-ligmentary Ectopic Pregnancy with death of the Fœtus occurring towards the sixth month. Total Extirpation of the Sac. Cure.

SILLES and POUX (*Compt. Rend. Soc. d'Obst. de Gyn. de Paris*, June, 1909) report: The symptoms occurred in a patient aged 29 years, who had a previous normal pregnancy seven years before. Five years later she had been treated for endometritis and left-sided salpingitis by medical means. In May of 1908 the last menstrual period took place, and after this the patient had symptoms which led her to the belief that she was pregnant. In July she was seized with severe abdominal pain, especially in the left side, accompanied by vomiting and faintness, together with distension of the abdomen and some hæmorrhagic discharge. Some days later a pear-shaped, thickened membrane was expelled, giving relief to the patient. A month later the pain in the left iliac region returned with greater severity, faintness and sickness were also present, the pulse being feeble and rapid, the temperature being somewhat raised. These symptoms were relieved by rest in bed but returned at intervals, the last severe attack occurring in October. The abdomen increased in size but no fœtal movements were felt. In February the pains occurred and were somewhat like labour pains, but no change had taken place in the condition of the cervix. In March the diagnosis of extra-uterine pregnancy, with death of the fœtus, was made. On examination, previous to operation, the tumour was found to lie in the median line of the abdomen and to the left. On the right side it was soft and not sensitive, but on the left it was found to be hard, very tender to pressure, and fixed as if bound down by adhesions. The uterine sound could not be made to reach the fundus on account of the position of anteflexion of the uterus. No fœtal heart sounds could be heard, but a slight bruit was made out towards the left of the umbilicus. The patient was admitted to the hospital in April and an abdominal section was performed. On opening the abdomen the tumour was found to have its origin in the left broad ligament, the uterus was enlarged, adhesions to the bowel were found below and posteriorly to the tumour, and the cyst was punctured in order to facilitate its removal, but only a small amount of dark-coloured fluid was withdrawn. With some difficulty the tumour was raised up and the pedicle ligatured and the mass removed. The abdominal cavity was drained with gauze for twenty-four hours. The patient made a good recovery.

On opening the sac the walls were found to be much thickened and covered with fibrin; the fœtus, greatly compressed, was about six months.

The authors comment upon the previous history of left-sided salpingitis as a factor in the causation of the condition.

A. LOUISE MCILROY.

Menstrual and similar Hæmorrhages shortly after Conception and Delivery.

Schatz, Rostock (*Volkmann's Samml.*, 518). In 1904 the writer devoted over a hundred pages of the *Archiv f. Gynäk.* to attempting to answer the question "When does labour begin?" by means of elaborate diagrams of curves of blood pressure. The article under review is similarly illustrated by elaborate diagrams of blood pressures which are intended to explain the phenomena of the pregnant and parturient states.

A hæmorrhage occurring in the first month of pregnancy may be an ordinary menstruation, as the text-books explain, or may be due to a displacement of the impregnated ovum. Usually the ovum after impregnation makes two migrations: first from its place of fertilization to its site of imbedding, and secondly after its imbedding, if this be not in the middle line, to reach the centre of the uterine cavity. The first migration does not take place if the ovum becomes imbedded in the tube (tubal pregnancy) nor in the instances in which fertilization occurs in the uterus. This last is probably rare, for an unfertilized ovum cannot live more than a very few days in the uterus, and spermatozoa in a very few hours reach the tubes, which the unimpregnated ovum takes one or two weeks to traverse. On the other hand, the impregnated ovum stimulates the tubes to increased ciliary and peristaltic movements and is washed down in a few hours, or, at most, two days. The more eccentric the imbedding of the ovum the more extensive is its subsequent displacement towards the central line of the cavity, and, as the placenta remains adherent at the original site, there is dragging on the coverings of the ovum with stretching and hæmorrhage. This phenomenon is specially remarkable the more the uterus approaches to a two horned type in the human subject, and can be very easily observed in a cow: for of twenty cases of single pregnancy in that animal, in only one did Schatz find the fœtus remain in the original horn; in all the others the fœtus lay partly in the other horn along with 9 or 10 cotyledons of the placenta, while 20 or 30 of these were implanted in the original horn. The tense ovum at this stage may simulate a fibroid tumour, even when palpated with a finger passed into the uterine cavity. Illustrative cases are described as warnings against too hasty an emptying of the uterus for hæmorrhage in the early months of pregnancy.

The current teaching that menstruation first occurs from four to six weeks after delivery, and later during lactation, is not correct in Schatz's opinion. Hæmorrhage occurring 11 or 14 days after delivery is commonly menstrual, and may be assumed to be so if it be accompanied by the usual molimina which the woman has experienced during ordinary periods, and more especially if it yields in a few hours to treatment by administration of ergot and hydrastis and iced applications to the lower abdomen. A middle menstruation without hæmorrhage but probably with ovulation is pretty common, and the figures 11 and 14 given above correspond to the half menstrual months of 21 and 28 days respectively. Again, illustrative cases are given to show the danger of treating such cases as ones of retained portions of placenta, more especially if the cervix be not patulous. At the same time it is to be kept in mind that hæmorrhage from retained portions of placenta may be accompanied by pains similar to menstrual molimina, and that the pains suffered in menstruation may disappear after a first pregnancy. An absolute diagnosis is not easy to establish, and Schatz gives elaborate and somewhat unsatisfactory explanations of his blood pressure curves Similar menstruation is often seen after ovariotomy where the irritation of the pedicle is sufficient to make an intermenstrual ovulation be accompanied by an intermenstrual menstruation.

The last part of the paper discusses the question, "When is the ovum impregnated and when is the beginning of pregnancy?" It has been stated that menstruation is the abortion of an unfertilized ovum and consequently the impregnated ovum belongs to the first missed period. Schatz maintains this to be impossible as the ovum on this

hypothesis is set free only 2–3 days before the onset of menstruation, giving only two possible days for impregnation. Strassmann has gone the length of saying that there is no "first month" of pregnancy, and that 3 weeks from the last period a woman is not yet pregnant. Schatz on the contrary thinks fertilization may occur at any day of the period if there be a free ovum ready, for the spermatozoa can find their way to the tubes, through the uterus, even during menstruation, where they can wait for nearly a fortnight, but it is not known if this waiting can go on during menstruation. Ovulation occurs chiefly a day or two before the onset of menstruation, but at other times also. Schatz maintains that his pressure curves show that it is not the ovum of the first missed period which is fertilized. He is of opinion that commonly impregnation occurs within one day of intercourse. E. H. L. O.

The Surface Tension of the Urine during Pregnancy, Labour, and the Puerperium.

Rebaudi (*La Ginecologia Moderna*, June and July, 1909) describes an ingenious apparatus he has devised for estimating surface tension of liquids, and by means of which he has made numerous and accurate determinations of the surface tension of urine during pregnancy, labour and the puerperium.

The values of the surface tensions registered allow him to draw the following conclusions: (1) The surface tension of the urine of pregnant women is lower than the normal average of non-pregnant. The diminution is greater in the second half of pregnancy, especially during the last three months, gradually falling as the physiologic term approaches. At every period of physiologic crisis during pregnancy a lowering of the tension is noted. (2) In the period immediately preceding labour there is a further fall in the tension and its lowest value is reached just before the child is born. This decrease in tension is most conspicuous in the urine of women who have had long and exhausting labours, therefore it is generally more marked in primiparæ than in pluriparæ. (3) During the 12—16 hours after birth a continued elevation in tension is noted, but during the first day of the puerperium it again falls and remains low till the 3rd or 4th day. It then begins to ascend gradually and regains its norn al value in 12—15 days. (4) The return to the normal takes place more rapidly in women who do not nurse their children than in those who do.

Fränkel and Cluzet have shown that the substances which cause a lowering of the surface tension of urine are bile, urinary and hæmatic pigments. A lowering action cannot be proved for albumen, urea or sugar, while mineral salts have a feeble increasing influence. Rebaudi's researches confirm these results and show further that the fall of tension is up to a certain point proportional to the increase in bile pigments, reaching a minimum when the latter are at a maximum, and showing corresponding oscillations. An important deduction may therefore be drawn (1) that the production of urobilin depends on the efficiency of hepatic cells and may be taken as an index of that efficiency, (2) if oscillations in its quantity indicate corresponding differences of exchanges of the albuminoid molecules of the tissues, then it may be affirmed with all probability, though with certain reserve, that the values of the surface tension of the urine serve as indirect indices of hepatic efficiency and of the rate of exchange and oxidation of albuminoid tissue elements. J. H. F.

The Preventive Treatment of Puerperal Eclampsia.

A. M. Bankier (*Brit. Med. Journ.*, 1909, vol. ii, p. 549) examines the urine in all cases of pregnancy at the seventh month. If albumin is found the patient is kept in bed until after labour; the diet is principally milk and potassium acetate is given in sufficient doses to keep the urine alkaline. Bankier claims that the potassium acetate, while not reducing the albumin, prevents eclampsia, but is useless in cases where convulsions have actually occurred. Frank E. Taylor.

Decapsulation of the Kidneys in Eclampsia.

K. Reifferscheid (*Zeitsch. f. Gynäkol. Urol*, Nr. 3, 1909) reports two cases of eclampsia, and one of severe pregnancy nephritis, treated by decapsulation of the kidneys. All three died, though in two, a transitory improvement was noticed.

The author has collected 30 published cases of this operation in eclampsia. The mortality is 50 per cent. Final judgment as to its value cannot yet be given, though the striking success that has followed in some cases seems to justify it. He differs strongly from Edebohls, who says that, in pregnancy, the operation should be performed without a preliminary emptying of the uterus, and from Gauss, who proposes to perform the operation in every case of eclampsia, after emptying the uterus. He would prefer to wait 8 or 10 hours after the completion of labour, to see if the renal functions improved, and only to operate if no improvement occurred.

Grave Eclampsia at sixth month of Pregnancy. Impossibility of applying medical treatment. Accouchement forcé. Recovery.

Guillermia (*Bull. Soc. d'Obst. de Paris*, April—May, 1909) reports: As medical treatment is always advocated for cases of eclampsia whenever possible, the author gives the record of a case where obstetrical treatment could only be employed. The patient—quartipara,—pregnant five and a half months, had been seized with violent convulsions, and on examination was found to be in a comatose condition, cyanosed, and with bloody froth coming from the mouth. The fits were typical of eclampsia in character, and followed one another in quick succession, consciousness not having been regained since the onset. Some drops of urine, taken by catheter, were found to contain a large amount of albumen which became solid on heating. The uterus extended to above the umbilicus, the cervix long, but no signs of labour were present. The question of bleeding was considered, but owing to the œdematous condition of the tissues no vein of sufficient size could be located in the arm or leg. An incision, however, was made into the tissue, but only a few drops of blood were withdrawn. No fluid could be given by the mouth owing to the comatose condition, and the rectum was packed with fæcal matter, the last motion having taken place eight days previously. Several enemata were given, but no fæcal material was brought away. Chloroform inhalation were given, but these had no beneficial effect on the attacks of convulsions. As the condition seemed hopeless and the patient's surroundings unfavourable for prolonged treatment, delivery was decided upon. The hand was gradually introduced into the cervix, which was softened, the membranes were ruptured, the foot of the fœtus was seized and delivery effected. The manipulations only took twenty minutes in duration. On expulsion of the uterine contents the fits ceased immediately, and the patient became conscious, and a purgative was given by the mouth. There was considerable post-partum hæmorrhage, giving rise to some alarm. The uterus was packed and the patient made a good recovery.

In such a case the only treatment possible seems to have been rapid delivery, as expectant treatment was out of the question. A. Louise McIlroy.

Hydroa Gestationis.

E. Ward (*Lancet*, 1909, vol. ii, p. 1827) records the occurrence of the erythematobullous type of hydroagestationis in the fifth month of the eighth pregnancy of a woman aged 26, the eruption almost symmetrically affecting both legs, commencing about four inches below the tubercle of the tibia and extending downwards for another four inches. The eruption had been present for two days and caused great suffering and loss of sleep from intolerable continuous itching, burning and tingling. The eruption had occurred during each of the seven previous pregnancies, appearing

at times varying from four months to the puerperium and took ten weeks to cease. It also showed a tendency to break out late in December on each occasion. Ward considers that hydroa gestationis is one of the great group of diseases due to the toxins of pregnancy, but its exact relationship to other forms of dermatitis herpetiformis remains uncertain. FRANK E. TAYLOR.

On the Pathogenesis of Hydatid Moles.

KURT HEILBRUN (I. D. Halle, 1909; *Muenchener m. Wchns.*, No. 32, S. 1659) says that the formation of an hydatid mole only occurs when, owing to some deficiency in the fœtal circulation, the material abstracted from the maternal blood by the chorionic epithelium is not transferred to the fœtus. This material then accumulates in the stroma of the villi which consequently swells; moreover, the epithelium itself is over nourished and may proliferate. These conditions for a complete hydatid mole occur upon the primary death of the fœtus, if the periphery of the ovum retains its vitality, and the ovum is retained for a considerable time during which the villi are freely exposed in the maternal blood spaces. Incomplete hydatid moles, also, depend upon impediments to the fœtal circulation, and careful examination proves that the swelling of the stroma is not in all cases of limited extent, but frequently the macroscopic changes can only be detected in some of the villi in which the congestion has been more pronounced. The œdema of congestion may in these supervene upon the swelling due to retention of material taken up by the chorionic epithelium. The real cases of partial hydatid moles however depend upon deficient or seriously impeded circulation in the pedicle of the villi, and the cause for the disturbed circulation should be investigated in every case. Anything that causes the death of the fœtus may therefore, under the conditions stated, lead to the formation of hydatid mole. In its pathological anatomy the hydatid mole is not malignant, for all its symptoms and results can be explained mechanically. J. J. M.

Hydatidiform Mole and Cystic Degeneration of Both Ovaries.

REBAUDI (*Annali di Ostetrica*, July, 1909) describes a case, interesting from the light it may throw on the relation between cystic degeneration of both ovaries, hydatidiform mole and malignant chorionepithelioma.

Last October a young primipara in the 3rd month of pregnancy expelled a hydatidiform mole. A month later she was found to be suffering from cystic degeneration of both ovaries, which were removed. From macroscopic and microscopic examination it was evident that the multilocular cystic appearance of the ovaries was due to a more or less advanced degeneration of the corpora lutea. It was suggested that the ovarian degeneration might be the consequence rather than the cause of the mole, and the point could not be decided with certainty. The advanced state of the ovarian degeneration, however, obviously dating from a longer period than 4 months, would favour the hypothesis that the ovarian lesion was prior to the pregnancy and hence the cause of the hydatidiform mole. J. H. F.

Incarceration of Gravid Retroverted Uterus and Consequent Gangrene of the Bladder.

P. VON KUBINYI (*Volkmann's Samml.*, No. 519) reviews several cases that have occurred in the clinique of Tauffer in Budapest, and one of these is given with much interesting detail, including the cystoscopic appearances from day to day. Von Kubinyi describes also experiments carried out by himself on the cadaver and on animals in regard to the bursting strain and the appearances in extreme distension. He is of opinion that distension of the bladder with fluid causes anæmia of the mucosa and congestion of the intra-muscular and subperitoneal vessels, and can by

itself lead to gangrene. The exfoliation is the result and not the cause of the gangrene. When a slough has once formed the sooner it is thrown off and the sooner it is removed from the bladder the better for the chances of the patient escaping death from sepsis. When recovery takes place the mucosa is replaced by scar tissue, often markedly trabecular, leading to sacculations in the wall. He attempts to show that the retention must last several days to cause gangrene, though a few lines higher he mentions a case of gangrene following on the retention for 12 hours of a tight packing in the vagina in a case of abortion.

Treatment is advocated on the usual lines: emptying the bladder and reposition of the displaced uterus if possible, but if the bladder be already in a state of gangrene it may be safer to empty the uterus, through the posterior vaginal wall if necessary; sloughs should be removed, and this may be accomplished, if necessary, by incisions per vaginam. Laparotomy is occasionally necessary to relieve the uterus. The separation of the sloughs and their removal from the bladder is often followed by an immediate amelioration of the patient's condition. E. H. L. O.

The position of the Bladder during Labour.

Ed. Martin (*Arch. f. Gynäkol.*, vol. lxxxviii, Ht. 2, 1909) has made observations in 22 cases, with normal pelves. The method he used was to fill the bladder with a suspension of bismuth, and then take X-ray photographs. His results confirm the fact, already known, that the moderately filled bladder is displaced towards the right side. This displacement is quite independent of the lie of the child, but is rather to be explained by the usual rotation of the uterus to the right. The extent of the displacement is not influenced by the stage labour has reached, but by the size of the presenting part, by the quantity of liquor amnii, and by the thickness of the tissues around the bladder. The trigone and the upper part of the urethra can sometimes accompany the bladder in its displacement. Martin was able also to observe this position of the bladder in some cases of extraperitoneal Cæsarean section. He points out that in pubiotomy it is better to saw through the bones on the left side, but admits that conclusions as to the displacement of the bladder in cases of contracted pelvis, cannot necessarily be drawn from observations made upon cases of normal pelvis. Such observations in cases of contracted pelvis have not been made: indeed, it is hard to find sufficient material for an extended series. In this connection, the relatively frequent injury of the bladder in pubiotomy, even when done in the left side, is striking. The paper is illustrated by drawings of anatomical preparations, as well as by reproductions of the X-ray photographs.

A very rare Presentation in a Twin Pregnancy.

Carli (*Annali di Ostetrica*, July, 1909) reports a rare presentation in a twin pregnancy. A pluripara was brought to hospital because of the impossibility of delivering the second child. It was there found that the presentation was a vertex, but with the two lower limbs and the right upper limb prolapsed. Replacement of the limbs was tried in vain, and finally the child was born by version, which was executed with difficulty owing to the very abnormal fœtal attitude. J. H. F.

Triplets with Fibromatous Uterus.

Audebert (*Compt. Rends. Soc. d'Obst. de Gyn. de Paris*, June, 1909) reports: During the pregnancy the patient, a primipara aged 24 years, was troubled with vomiting, constipation, and varicose condition of the lower limbs. At intervals there was a slight discharge of blood-stained fluid. When about seven months pregnant some hæmorrhage occurred, and the patient entered the hospital but did not think herself in labour. The uterus was found to be 29 cm. in the median line, irregular in

outline, bicornute in form, with a median furrow. On palpation a tumour was felt to the right of the uterus, the furrow rising up to the level of the umbilicus and separating the fundus into two masses. The uterus was hard and retracted, no fluid being made out in its cavity. The contractions were transmitted to the tumour situated on the right. On auscultation a single fœtus was found to the right of the middle line. The cervix was somewhat dilated and a head was found engaging in the pelvis. Dilatation was rapid and the first fœtus was expelled; the second being delivered after bringing down a foot, as the position was transverse. The third fœtus was delivered as a breech. The hand was introduced into the uterus on account of retained placenta, and two placentæ were delivered, which occupied the right uterine cornu. The other placenta was delivered spontaneously. On palpation of the uterus a small fibroid, the size of a walnut, was found to the right of the fundus. There was some rise of temperature during the puerperium, but the patient regained the normal condition in a few weeks. A. Louise McIlroy.

Ruptured Uterus, with Recovery.

R. N. Glach (*Lancet*, 1909, vol. ii, p. 229) was called to a woman in labour after the pains had completely stopped, the patient being in a very collapsed condition. Internal version was performed and the child was delivered. On inserting the hand to remove the placenta a large rent was found in the posterior wall of the uterus about 6 inches in length, commencing from the vagina and running upwards. The edges of the rent were merely placed in apposition. For 48 hours the patient's condition was desperate; she then rallied and for three weeks had a subacute peritonitis, but subsequently made a perfect recovery. Frank E. Taylor.

Sprain of the inter-pubic articulation during a natural labour.

Garipuy (*Compt. Rends. Soc. d'Obst. de Gyn. de Paris*, June, 1909) reports: The patient, a secundipara æt. 32 years, had an uneventful pregnancy without any symptoms of relaxation in the region of the symphysis pubis. Labour was normal, the only point to be brought out on enquiry was that the patient had been very restless in the first stage, and had been rolling from side to side and throwing her legs about. Delivery took place without any difficulty and no crepitation was noted. Gradually, the symphysis pubis became painful, and twenty-four hours after delivery the pain was so severe as to prevent the patient sleeping; it was increased on the slightest exertion and was only absent when rest was complete. On the sixth day, on the patient attempting to rise, the pain became so severe as almost to cause her to faint, and medical aid had to be called in. On examination the seat of the pain was easily located in the articular interspace of the symphysis pubis; it was very tender on the least pressure, and on movement of the lower limbs. The pubic bones did not appear to have been separated nor was there any exaggerated relaxation of the symphysis. Absolute rest was prescribed with the addition of a binder. In three weeks the patient was quite well and was able to get up, very slight inability of the symphysis being present without any functional disturbance.

The condition has been one where inter-pubic widening has led to the rupture of several fibrous articular bundles without bringing on a true separation, that is, a sprain of the second degree. The most common causes to bring about such a condition are instrumental or manual interference during labour, pelvic contraction, or an abnormal fœtus. In this case the condition was caused by the movements or position of the patient herself. Several cases have been reported, according to Garipuy, of a similar nature; in one the separation was caused by an assistant separating the thighs, another by placing the patient in the lithotomy position.

A. Louise McIlroy.

Late Cæsarean operation for prolapse of the Cord in an elderly Primipara.

Lepage (*Compt Rend. Soc. d'Obst. de Gyn. de Paris*, June, 1909) reports: The patient, a primipara æt. 35 years, was admitted into hospital in labour and with the history of rupture of the membranes having taken place three days before. On examination the head was found to be engaged in the pelvis, the cervix dilating. Next morning the cervix was found to be considerably dilated and the unruptured bag of membranes could be felt. This may have been a secondary bag of membranes, as the patient was firm in her statement that rupture had taken place previously; the head had not made much progress in its descent. At midday, the membranes ruptured spontaneously and dilatation was complete. As the patient was worn out, and expressed her desire for a Cæsarean section, so as to ensure a living child, she was put under chloroform for further examination. The head was found to be high up in the pelvis and forceps was applied and re-applied and traction employed, the only result being spontaneous prolapse of the cord at the vulva. On this account Cæsarean section was decided upon. On passing the catheter blood was found in the urine. The abdomen was incised and the uterus raised up out of the wound, the placenta being situated on the anterior wall. Extraction was easy, the child being healthy, the head showing some moulding of its contour. The placenta was removed without difficulty, and a drain introduced into the cavity of the uterus. The abdominal wound was closed by three layers of sutures, cat-gut for the peritoneal and muscular layers, and silk for the superficial skin layer. The patient made a good recovery.

The author lays stress upon the interest of the case on account of the operation having been performed without any ill effects on a patient who had been in labour for a considerable time, the cord having prolapsed after ineffectual attempts at delivery by forceps. A. Louise McIlroy.

The Campaign against Puerperal Fever.

Eckstein, Teplitz (*Volkmann's Samml.*, 510), relates his experience in his third quinquenium of midwifery practice; his first and second lustres have been already published. He bewails the increase of puerperal sepsis especially in the hands of midwives, who attend more than 90 per cent. of the births; he attended only 13 normal deliveries in a total of 335 cases! He draws attention to the *rabies operandi* of some cliniques and advocates patience and trust in the natural powers and, in general terms, conservative midwifery. After passing through a stage of non-interference he now uses vaginal douches prophylactically, and in all his cases administers ergot after the emptying of the uterus. He insists on the uselessness of washing the hands or subsequent soaking in watery solutions of antiseptics, and pins his faith to alcoholic incarceration of the germs in the skin. He calls on the state to do more in teaching midwives asepsis and in enforcing the ordinary rules of sanitation. He groups his cases and makes notes on each class. The article is of interest as an illustration of the conditions obtaining in Bohemia. E. H. L. O.

Placenta Prævia, its Surgical Treatment.

R. Labusqière (*Annales de Gyn. et d'Obst.*, July and August, 1909) summarises the various views held by recent writers for the treatment of placenta prævia.

He quotes Sellheim and Krönig at some length, the former of whom recommends extraperitoneal uterine section and the latter conservative Cæsarean section, both giving statistics extremely favourable to both mother and child, but the number of cases is small. (The views of these observers have previously been summarised in this Journal, Vol. xv, p. 425.)

Baisch (assistant to Döderlein) recommends vaginal hysterotomy but admits that the operation is not one which would be of much value to the general practitioner.

A. Martin protests vigorously against the "fundamental modification which Krönig and Sellheim are trying to introduce into the treatment of placenta prævia," and thinks that their condemnation of the metreurynter may cause considerable harm.

Blumreich quotes 74 cases of placenta prævia in only one of which it was necessary to perform abdominal uterine section owing to rigidity of the cervix.

J. Veit has not found an indication for Cæsarean section in any of his cases.

Hannes (assistant to Kustner) quotes 246 cases of placenta prævia with a maternal mortality of 6·6 per cent. and a fœtal mortality of 30 per cent., excluding those cases in which the child was dead or not viable before the operation; none of these cases were treated by uterine section. He is a strong advocate of metreurysis.

Pfannanstiel recommends the metreurynter as does also Thies (assistant to Bumm), who gives the fœtal mortality of different operations as follows: Spontaneous delivery 20 per cent.; vaginal plugging or colpeurynter 33 per cent.; combined version with slow extraction 80 per cent.; combined version with rapid extraction 64 per cent.; vaginal Cæsarean section 50 per cent.; metreuryuter 14 per cent. (These figures include all births.)

Zimmerman gives a maternal mortality of 3·3 per cent. and a fœtal of 23·7 per cent. for a series of cases treated by metreurysis collected by him. In 28 cases treated by himself all the mothers and children survived.

Newall (Boston) admits the value of Cæsarean section in certain cases, but considers combined version with slow extraction satisfactory in most cases, and he urges that more care should be taken to diagnose the condition early and considers that the bad results obtained in the treatment of placenta prævia are due to failure of early diagnosis.

N. R. Mason and Z. Williams (Boston), after analysing 155 cases, recommend version with rapid extraction for multiparæ but Cæsarean section for primiparæ.

Finally, the author gives a summary of the recent discussion at the American Gynæcological Society (April, 1909) and concludes that Cæsarean section is only occasionally necessary in placenta prævia and that it should only be performed by competent operators under favourable conditions. He considers that in general practice, if one may judge by the results obtained in the Clinique Baudelocque by rupture of the membranes and the use of Champeter de Ribes bag, the indications for hysterotomy must be exceptional. A. M. H. Gray.

Placenta Prævia and its Treatment.

Hammerschlag, Koenigsberg (*Muenchener m. Wchns.*, No. 32, S. 660), at the recent congress of German obstetricians and gynæcologists, on the ground of his own clinical experience and an enquiry he has made among general practitioners, draws the following conclusions: (1) Far more cases of placenta prævia are treated in general practice than in hospitals; it is therefore essential that a method of treatment adapted to general practice should be formulated. (2) Medical aid in cases of placenta prævia is generally sought too late for the patient to be transferred to a hospital: Cæsarean section therefore is seldom practicable. (3) It is improbable that even if Cæsarean section were systematically performed it would give better results than the methods hitherto adopted; Cæsarean section therefore cannot be accepted as a method to be adopted. After a critical consideration of the conservative methods of treatment, Hammerschlag declares: (1) Plugging the vagina entails serious risk of infection without compensating advantages; it should therefore be discarded. (2) Combined version, though unfavourable for the child, is easily performed, and a safe proceeding in the interests of the mother; it should therefore be the method adopted whenever the child is dead or incapable of survival. (3) Metreurysis gives good

results as regards mother and child, yet practical considerations, especially lack of proper instruments, the longer duration of the labour, and the necessity of repeated interference, stand in the way of its exclusive adoption, nevertheless metreurysis is to be recommended whenever the child is alive and capable of survival.

NEU, Heidelberg (*ibidem*), referred to Lobenstein's dissertation which showed that in the Heidelberg clinic, among 50 cases of placenta prævia, after all allowable deductions, the maternal mortality was 8 per cent., that of the children, alive and mature, 58·4 per cent. The course of treatment adopted, in all cases in which the child was capable of survival and the mother not presumably infected, was classical Cæsarean section. Cases in which the child was not viable were delivered as promptly as possible without unavoidable force. Cæsarean section was always entertained also when the placenta prævia was central and the child not viable. The possibility of transferring the patient into a hospital should be considered in every case in private practice.

ASCH, Dresden, said that in most cases immediate help was necessary, and spoke in favour of vaginal tamponage and the metreurynter, and of kolpeurysis as a prophylactic measure to allow of the patient being transferred to a klinik.

KRÖNIG had found that the maternal mortality in midwives' cases was 15 per cent. He advocated the classical Cæsarean section, and by it had up to the present saved the lives of eight mothers and their children, but would willingly abandon this method of delivery could a better be found.

PFANNENSTIEL (the late) said that metreurysis, the introduction of which into practice we owed to Küstner, was easy to learn and carry out and gave excellent results. J. J. M.

Tuberculin Ophthalmo-reactions in the Newborn.

M. DUVERGER (*Annales de Gyn. et l'Obst.*, August, 1909) reports the results of instilling tuberculin solutions into the eyes of 500 newly-born children. Solutions of 1 per cent. and 0·2 per cent. were used, and special precautions taken to exclude inflammation of the conjunctiva from other sources. In all cases the results were negative.

The author summarises his results as follows: "(1) Considering the large number of cases that we have investigated, we have demonstrated one fact for certain, viz., the ophthalmo-reaction is always negative in the new-born. (2) We believe that we have furnished strong evidence in favour of the non-heredity of tuberculosis. (3) The constant absence of reaction in so large a number of individuals, certainly free from tuberculosis, makes us think that the opthalmo-reaction is never positive when the organism has not been infected with tuberculosis." A. M. H. GRAY.

REVIEWS OF RECENT BOOKS.

Ueber die Entstehung und Verbreitung der Tuberculose im weiblichen Genitaltrakte: von Dr. Albert Blau, Assistenten der Klinik von Rosthorn in Wien. 8vo ($9\frac{3}{4}\times5\frac{7}{8}$), pp. 96. Berlin: S. Karger, 1909. Price M. 4.

In this monograph, after a survey of the literature of the subject, including the general review by Feis (1907), Blau quotes an article by the late Professor von Rosthorn in Küstner's Lehrbuch der Gynäkologie (1908) as a fair statement of what is now known on tuberculosis of the female genital tract, to the effect that such disease, if not part of a general miliary tuberculosis, is merely a local affection. Local manifestations it has been the custom to distinguish as primary or secondary, but there is no clinical proof that such manifestation is ever primary, and many of the so-called secondary cases are certainly due to fresh infection, metastatic, hæmatogenous, or lymphogenous. At the same time, von Rosthorn admits that a primary tuberculosis of the genital tract may arise from ectogenous infection.

The modes of infection are various: (1) Hæmatogenous or lymphatic from foci already existing in the body; (2) Direct extension of the process from neighbouring organs; (3) Wound-infection (labour, injury, operation, examination, etc.); (4) Coitus; (5) Tuberculous discharges. The extension of the disease in the genital tract may be by ascending or by descending infection, far more frequently, however, by the latter, from diseased tubes or peritoneum. All authors agree that secondary tuberculosis is far more common than primary and that the infection is generally through the blood-vessels.

Blau then discusses the results of the experimental researches which have been made in recent years, gives details of 74 experiments performed upon guinea-pigs, by himself, and draws the following conclusions: The guinea-pig, though very prone to tuberculous infection, appears, except in the puerperal state or after traumatic lesion, to be less easily infected in the genital canal than through the skin or peritoneum, but, nevertheless, the introduction of tuberculous matter into the uninjured vagina may cause tuberculosis there. The injection of tuberculous matter into the uterus (after laparotomy) resulted in tuberculosis at the seat of the injection in about half the cases, and, in some instances, more proximally. Descending infection may be explained by the downward flow of infected discharge; he finds no experimental proof of ascending infection: an apparently ascending infection may be due to the simultaneous infection of more proximal portions of the mucosa, or to an invasion of the mucosa from without.

To compare clinical evidence with the results of experiment, Blau then examines the cases of genital tuberculosis recorded in Chrobak's klinik. He does not find among 36 cases a single one to be accepted as primary or as due to ascending infection, and concludes, on the whole, that without predisposing conditions, such as puerperium or trauma, and the presence of very virulent germs, primary cases do not occur. The protective influence of the secretions of the female genital tract and the thick epithelium of the vagina and cervix are no doubt the reason that genital tuberculosis is less common in women than in men.

The monograph is well worth careful study: a list of the publications on the subject which have appeared, since Weichselbaum's article in 1907, is appended.